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WATER QUALITY EFFECT OF DIKING A SHALLOW ARID-REGION LAKE

Dean K. Fuhriman, et al

Brigham Young University

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WATER QUALITY EFFECT OF DIKING A SHALLOW ARID-REGION LAKE

By

Dean K. Fuhriman, LaVere B. Merritt,
Jerald S. Bradshaw and James R. Barton

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Project Officer

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ABSTRACT

The inflow, outflow, and in-lake water quality and quantity of Utah Lake in Central Utah was studied over a 36-month period. The work was undertaken to determine the effect of a proposed diking project on the quality and quantity of lake water and to develop methodology for determining the effect of diking or other management practices on the quality of water in any lake system.

A computer simulation model was developed which is able to analyze the effect of a given management program on the water quality of the lake, particularly as related to the "conservative salts" present. The simulation model was also used to evaluate the evaporation from the lake by use of a salt balance technique.

Results of the research indicate that the diking of Utah Lake will have a positive beneficial effect upon the water quality of the lake and will also result in considerable saving of water and reclamation of valuable land.

This report was submitted in fulfillment of Project Number 16080 and Grant Number R-801400 by Brigham Young University under the partial sponsorship of the Environmental Protection Agency. Work was completed as of June 24, 1974.

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Financial assistance of the Environmental Protection Agency and the helpfulness of Project Officers Lowell Leach and Curtis Harlin has been greatly appreciated.

SECTION I

CONCLUSIONS

The diking of Utah Lake will result in salvaging about 75,000 acre feet of water per year. It will also improve the water quality since concentrations of dissolved ions will be decreased significantly since much of the water that would evaporate remains in the lake as "dilution" water.

The computer simulation model developed as part of this project may be used to predict water quality improvements and quantity savings which may result from diking of lakes at any location. It may also be used to investigate effects of many other water management alternatives in water resource development.

The amount of evaporation from Utah Lake is greater than previous investigators have estimated. The sub-surface spring inflow is also greater than has been presumed in previous investigations. Much of the sub-surface inflow to the lake probably comes from deep strata containing warm highly-mineralized water that issues into the lake in areas of geologic faulting.

The principles of salt balance incorporated into the simulation model developed on this project provide a valuable tool in refinement of evaporation estimates by the water budget method.

SECTION II

RECOMMENDATIONS

The computer simulation model developed on this project should be tested at other locations to provide a check on the model and to assist in the development of water resource planning decisions.

The positive results of diking of Utah Lake--improvement of water quality, savings of water, and reclamation of land for other uses--are such that investigations as to engineering and economic feasibility should proceed. Such investigations should include (1) the relative benefits and costs for each of the dikes considered separately as well as together, (2) evaluation of the numerous water management policies using the LKSIM model to determine the quantity and quality results of these policies, (3) pre-treatment of Provo Bay tributaries which are high in organic matter, phosphates or nitrates, and (4) dike design features and construction methods that will preserve fish habitat which may be eliminated in the diking process.

SECTION III

INTRODUCTION

Natural waters of arid regions are subject to the same factors which cause deterioration of water quality in humid regions--municipal, industrial and agricultural waste pollution, natural pollution from many biological processes, and excessive concentration of phosphates and nitrates. In addition to these universal problems, arid region waters contain great quantities of dissolved minerals--often in such excessive concentration that the water is unfit for many uses--and the total quantity of water available with which any contaminant may be diluted is often extremely limited. Many of the dissolved minerals in arid region waters; which are predominantly chlorides, sulphates, and carbonates of sodium, potassium, calcium and magnesium; have existed at relatively high concentrations since long before man came upon the scene. They are present mainly because the watershed soils of streams in arid areas have not been subjected to the greater precipitation and natural leaching which has been going on for centuries in humid areas.

Any process involving water use--whether it be natural or purposeful, beneficial or wasteful, planned or inadvertent--results in leaving the dissolved minerals as a residue in the soils of the drainage basin or in the waters of the basin, in increasingly greater concentrations. Most of the water "used" is taken from the waters of the basin by evaporative processes.

Water lost as evaporation from lakes or artificial storage reservoirs usually serves no immediate beneficial purpose and represents, in total, a tremendous quantity of water. In 1962, Meyers [1*] estimated the total evaporation losses from the fresh water areas of seventeen contiguous western states as 23,641,000 acre-feet, or 7,703,420,000,000 gallons (29,160 million cubic meters) annually. This is enough water to provide the irrigation water supply to about eight million acres (3.2 million hectares) of land, or the domestic water supply for more than one hundred million people. The economic value of such lost water is staggering.

The enormous quantity of water lost in evaporation from fresh water surfaces has attracted considerable attention from engineers and scientists, especially in the water-short arid regions. A great research effort has been carried on over the past two decades to find means of reducing the amount of evaporation losses. A major part of the research effort has been related to the development of a protective material to be applied to the surface of the water which will act to reduce or suppress the evaporation loss. The magnitude of this research effort may be indicated by the fact that in 1973, the office of Water Resources Research issued a 477-page bibliography on evaporation suppression.[2] In the 319 reports listed in the publication, studies were reported of various methods of reducing evaporation from water surfaces, but no research was reported in which the reduction of water surface area by any means was considered.

If a lake or reservoir is relatively shallow over all or a significant portion of its total area, it may be possible to materially reduce evaporation by reduction of the surface area. Such is the case with Utah Lake, located in Central Utah, where the surface area is large but the lake is shallow. Evaporation loss from this lake is equal to about one-third of the total capacity and nearly one-half of the average annual in-flow. Plans for the diking of Utah Lake have been under consideration

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[*] Superscript numbers refer to literature cited in SECTION X of this report.

for several years as a part of the Bonneville Unit of the U.S. Bureau of Reclamation Central Utah Project.[3] The proposed diking of Utah Lake would dike off two bays from the lake and reduce the surface area by about one-third resulting in the saving of about 75,000 acre-feet (925,500,000 cubic meters) of evaporation loss annually. The research reported herein represents an evaluation of the projected dikes as they relate to the quality of the water in Utah Lake and describes the computer model, LKSIM, that was developed to help evaluate the water quality and quantity changes associated with diking. This model was set up to be flexible and versatile so that it might be readily applied to other lake systems.

SECTION IV

DESCRIPTION OF UTAH LAKE

Utah Lake is located in Central Utah and is the primary fresh water lake in the Jordan River drainage basin (See Figure 1). Water is stored in Utah Lake and then released into the Jordan River and irrigation canals for use in the Salt Lake Valley. Water flowing from Utah Lake which is not diverted for irrigation terminates in the Great Salt Lake. The Great Salt Lake is a remnant of the Lake Bonneville of ancient times which at one time covered 20,000 square miles (51,800 square kilometers) in northwestern Utah and had a depth of about 1000 feet (304.8 meters). For a detailed description of the geology of Utah Lake and the surrounding valley, the reader is referred to Hunt, Varnes and Thomas[4] and Bissell[5].

The area and volume of Utah Lake vary depending upon the lake level. The control level is known as "compromise level," which represents a near maximum level above which the lake does not often remain for any extended period of time. At "compromise level" the lake has a surface area of about 95,000 acres (38,446 hectares), a volume of storage equal to 898,000 acre feet (1108 million cubic meters) and an average depth of 9.5 feet (2.88 meters), according to U.S. Bureau of Reclamation surveys made between 1953 and 1962. The lake level drops several feet each year during the hot summer months, when water is being used for irrigation and when large amounts of water are being evaporated. During periods of drouth, the lake has decreased greatly in size and depth reaching a record level 12 feet (3.66 meters) below "compromise" after the great drouth of 1934.

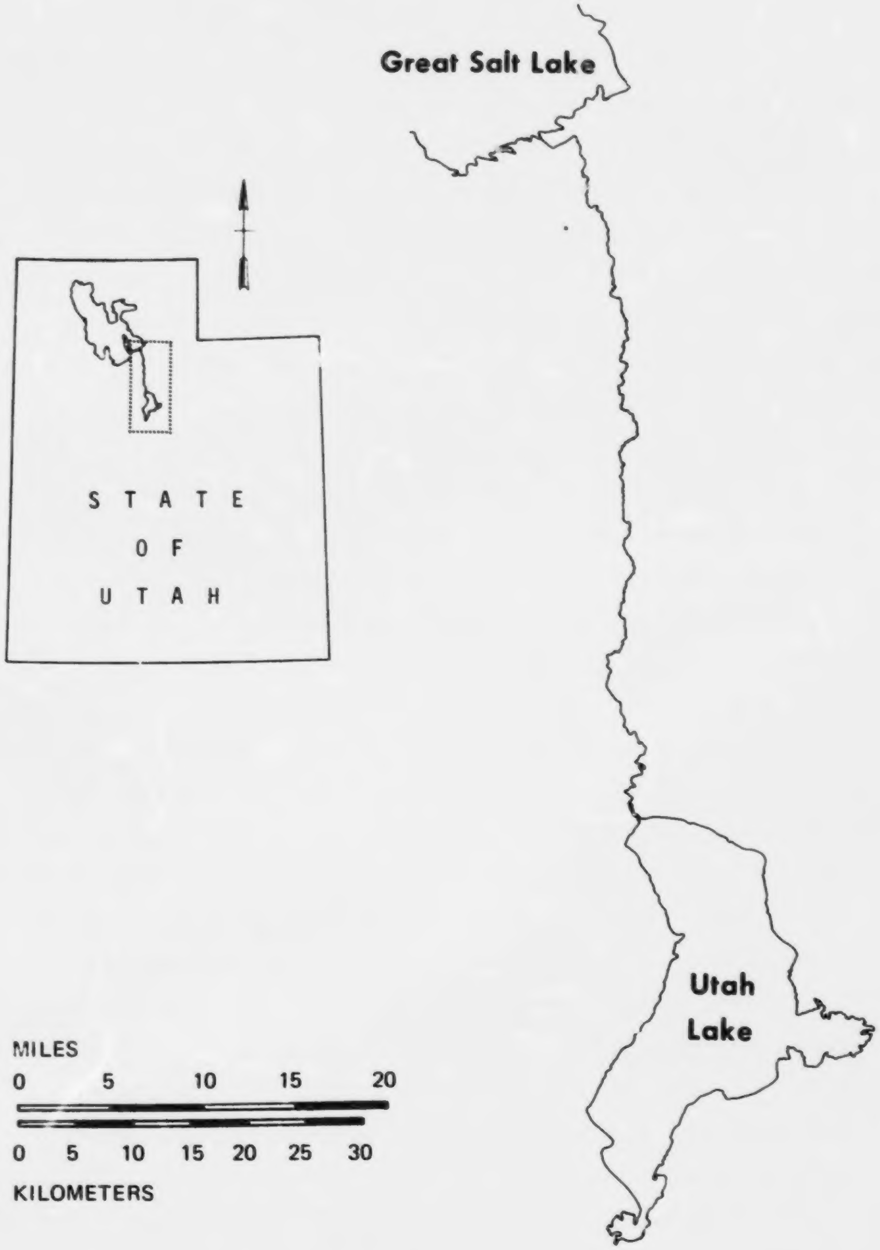

Great Salt Lake
STATE
OF
UTAH
Utah
Lake
MILES
0 5 10 15 20
0 5 10 15 20 25 30
KILOMETERS

Figure 1- Map showing location of Utah Lake and Jordan River

The lake has a mud bottom throughout most of the lake, composed largely of lake sediments of clay and silt. The waters of the lake are often turbid, since frequent winds on the lake generate rather high waves which stir up the bottom sediments and re-deposit them. The usual wind direction is from the north, but south winds also occur at times. During times of wind, in addition to the wave action which is generated, a seiche is established with the water level at the leeward end of the lake reaching a level of as much as two feet (0.61 meters) in elevation above the water level at the windward end. This fact causes some difficulty in evaluating the "change in lake storage" in "water-balance" calculations.

There are about 51 streams of water in definite channels which flow into Utah Lake during all or a substantial part of each year. The Jordan River represents the only natural outflowing stream, but there are several locations where water is sometimes pumped from the lake for use in irrigation.

A number of springs issue forth beneath the water surface of the lake. These springs are generally of two types--either warm rather highly mineralized waters, or cool waters of good quality. The warm mineral springs seem to issue from a geologic fault or faults extending across the lake in a general north-south direction from Saratoga Resort on the northwest shore of the lake to Lincoln Point. The cool springs are located mainly near the north and east shores of the lake and seem to be similar in mineral content to well water from the shallow artesian aquifer along the east and north shore of the lake. The presence of these under-water springs introduces some difficulty into the water balance studies required to evaluate various water quality effects of the lake. The amount and quality of water from the springs in the lake will be further discussed in SECTION VII.

SECTION V

DIKING PLANS FOR UTAH LAKE

Consideration of plans for diking of Utah Lake to curtail the evaporation by reducing the surface area of the lake date back many years. In 1905. Swendsen[6] wrote of such consideration by the then newly-organized Reclamation Service of the federal government. The investigations included the measurement of 33 inflowing tributaries to the lake over a five-year period, limited studies of the underwater springs in the lake, records of lake level fluctuations, and notes relating to the nature of the bottom sediments along the lines of proposed dikes across the Provo and Goshen Bays. Considering the limited knowledge of the field of soil mechanics and the relatively primitive earth moving equipment available, it is not surprising that the conclusion was reached that the construction of the proposed dikes should not be undertaken at that time.

A plan to dike Provo and Goshen Bays is included in the Bonneville Unit of the U.S. Bureau of Reclamation Service Central Utah Project. Some parts of this unit are already under construction. The proposed dike locations are shown in Figure 2. The present plan[3], calls for the Goshen Bay land reclaimed by diking, to be used as a waterfowl refuge and the Provo Bay land to be drained and used for agricultural purposes. At compromise level, the Goshen Bay and Provo Bay dikes would reduce the lake surface area by 26,776 acres (10,836 hectares) and 6,961 acres (2817 hectares), respectively. This represents a total area equal to 35.5 percent of the existing lake area. Design details for the dikes have not been completed, nor has a definite program date for construction been established.

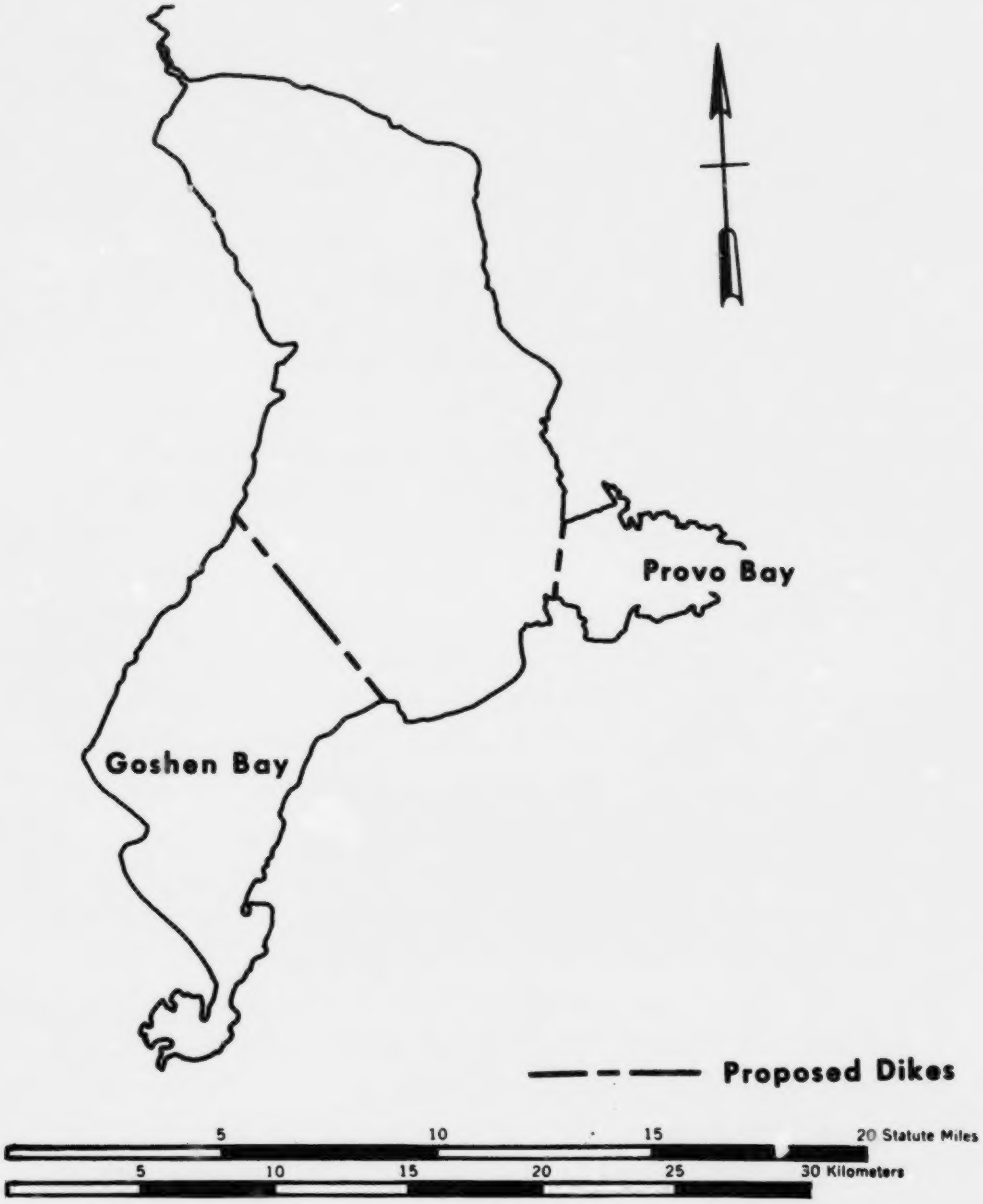

Provo Bay
Goshen Bay
Proposed Dikes
5
10
15
20 Statute Miles
5
10
15
20
25
30 Kilometers

Figure 2- Map of Utah Lake showing proposed diking of Goshen Bay and Provo Bay

The project reported herein was planned to provide information relating to the effect of the proposed diking upon the water quality of the lake, and to develop methodology which could be applied to other similar projects which may exist at other locations.

SECTION VI

COLLECTION OF DATA

The task of collection of the data required to make the evaluations of this study was a monumental one. Fifty-one surface streams are tributary to Utah Lake. The quantity of flow in each of these streams fluctuates with time, and it was therefore necessary to install measuring devices and make regular observations of the flow at frequent intervals throughout the study period. It was also necessary to obtain samples for determination of quality parameters from the inflowing streams, the outlet stream (the Jordan River) and at many points in the lake. This massive program of measurement, sampling, and chemical and biological analyses of the samples was initiated in June 1970. Some scattered water quality data prior to that time was found and included in the data tabulation of the project. Most of the flow measurements were made jointly by project personnel and the staff of the Provo River Project office of the U.S. Bureau of Reclamation. Most of the lake and stream sampling and analyses during 1970-72 was done by the research project staff. Tributaries were measured at least weekly during the summer months and less frequently during the winter.

The U.S. Geological Survey maintains regular water stage recorder records on the Provo and Spanish Fork Rivers near their point of entry into Utah Lake. Their records were included in our project tabulations. Effluent flow from the Geneva Steel works were furnished to our project by the engineering staff of Geneva Steel Company. Effluent data from Provo, Orem, and American Fork sewage treatment works were provided by the Utah State Department of Health, and effluents from other sewage treatment works in the valley were included as part of the flow of measured tributaries.

Information on lake levels was obtained from the water stage recorder operated by the Jordan River Commissioner.

Precipitation records were compiled from regular U.S. Weather Bureau stations in the valley and also from supplemental stations at several locations established by the U.S. Bureau of Reclamation. Evaporation pan data for the U.S. Weather Bureau station at Lehi were obtained from the Weather Bureau. Supplemental records during part of the study period were obtained from temporary stations established by the U.S. Bureau of Reclamation at the Provo Airport and at Dixon Farms, near the south end of the lake.

Water quality data for under-water springs were derived from Harding[7], Subitzky[8], Mundorff[9], and Milligan, et. al.[10].

A listing of the lake and tributary water measurements and sample analyses made during the investigation is included in Appendix A. Some water quality data from samples taken over a three-year period prior to the beginning of this project are also included in the listing.

SECTION VII

ANALYSIS OF DATA

WATER BUDGET STUDIES

The hydrology of a lake may be studied in detail by making a water budget study. This involves a quantitative determination of all inflows (inflowing surface tributary flows, precipitation on the lake surface, and sub-surface seepage or spring inflows), and all outflows (outflowing surface streams, evaporation from the lake surface, transpiration from vegetation growing in the water, and sub-surface seepage into the material under-lying the lake). If inflows and outflows are defined as above and are all measureable, the outflow plus or minus the change in storage should equal the inflow. However, it is not possible to measure evaporation loss from a large body of water, and so the water budget method is often used as an indirect method of determining evaporation. It is also usually impossible to measure accurately the subsurface seepage into or out of the lake. In the Lake Hefner (Oklahoma) studies[11, 12], the lake was carefully selected, primarily because of its geologic characteristics. Lake Hefner is underlain by a shale formation which is relatively impermeable, and the influent and effluent seepage is an outward flow of about six acre feet per month. With such a small seepage factor, and careful measurement of other parameters, the researchers were able to determine lake evaporation with much greater accuracy than had been possible in any previous investigation.

In the Utah Lake studies reported herein, it was known from previous reports that there are a number of springs in the lake. The amount of inflow to the lake from these springs has never been accurately determined, and therefore this un-measured quantity must be evaluated in the water budget calculations--along with the evaluation of evaporation losses from the lake. It is obvious that if all of the other water budget factors can be measured or accurately estimated, an over-estimate of evaporation will also result in an over-estimate of subsurface spring flow if it is determined by the water budget. Conversely, an under-estimate of evaporation will result in an underestimate of subsurface spring flow, if spring flow is calculated from the water budget equation. Recognizing this problem, it was determined that it would be advantageous to develop some criteria for evaluation in addition to the water budget analysis. A method of analysis involving salt balance was developed, and this method and the actual analysis are discussed in the following sub-sections, in which data for each factor in the water budget analysis are considered in detail.

Inflowing Tributaries

All of the surface tributaries to the lake were located by study of maps and by air or ground observation.

A total of 52 tributaries were located. A summary of the flows of all of the tributaries for each month from July 1970 to June 1972 is shown in Tables 1 and 2. It is noted that station number 30 shows no entries. The flows of this tributary were found to be insignificantly small, and the measurements were discontinued after the first year. Measurements were made of the major tributaries also during the 1972-73 year. The remaining inflows for that year are combined together as one estimate for "un-measured" inflow. The resulting measured and un-measured data for 1972-73 are shown in Table 3.

The two largest tributaries, Provo River (No. 29) and Spanish Fork River, (No. 48) are included in the network of stream gaging stations maintained by the U.S. Geological Survey and are equipped with automatic

Table 1. UTAH LAKE SURFACE TRIBUTARY INFLOWS, 1970-71

(All Figures are in acre-feet of water)

Tributary Number	1970 July	Aug.	Sept.	Oct.	Nov.	Dec.	1971 Jan.	Feb.	March	April	May	June	Totals July-June
1	44	33	57	26	0	0	0	0	0	17	16	3	196
2	46	25	24	45	0	0	0	0	0	0	2	19	161
3	0	0	0	0	0	0	0	0	0	7	59	37	103
4	24	28	23	32	30	33	33	33	34	32	34	35	371
5	23	13	37	7	20	16	21	30	14	18	23	67	289
6	138	126	234	69	55	67	73	66	64	73	104	146	1215
7	43	62	37	40	29	34	75	47	40	81	102	65	655
8	353	117	385	436	376	383	404	314	274	316	327	392	4077
9	1287	678	1240	1507	1642	1474	1519	1189	1207	1066	977	1363	15149
10	207	236	275	262	213	185	191	175	181	185	240	269	2619
11	163	129	95	83	74	74	74	76	80	80	117	215	1260
12	64	58	99	80	61	54	60	47	35	61	136	154	909
13	58	67	45	52	44	26	23	21	23	25	49	501	934
14	148	163	153	155	126	109	120	102	109	128	125	226	1664
15	157	156	153	195	174	155	156	138	156	163	191	189	1983
16	143	73	118	119	99	93	111	111	122	124	146	152	1411
17	401	255	356	319	222	156	158	131	159	235	368	472	3232
18	1444	1569	2686	2442	2081	1866	2115	1725	1819	1974	1673	1519	22913
19	1	3	0	0	0	0	0	0	0	0	0	0	4
20	1842	2027	1849	1910	2170	2165	2196	1741	1910	2006	1910	1805	23531
21	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	8	8	6	6	4	2	0	34
23	0	0	0	0	4	6	6	6	6	6	5	2	41
24	12	8	11	17	20	19	22	17	16	15	13	13	183
25	67	98	58	59	82	94	119	88	85	23	72	89	934
26	314	313	289	252	296	217	202	199	225	217	252	260	3036
27	1210	1270	1240	1380	1440	1420	1500	1480	1540	1450	1530	1320	16780
28	7	0	28	35	68	67	182	129	79	87	47	28	757
29	1250	633	1220	9500	20700	23350	19280	17170	13310	18800	11690	19500	156403

Table 1. (Continued) UTAH LAKE SURFACE TRIBUTARY INFLOWS 1970-71

(All figures are in acre-feet of water)

Tributary Number	1970 July	Aug.	Sept.	Oct.	Nov.	Dec.	1971 Jan.	Feb.	March	April	May	June	Totals July-June
31	78	121	164	149	177	160	116	106	119	143	118	66	1517
32	49	44	44	45	42	43	43	39	43	46	47	55	540
33	6	6	6	7	7	7	7	7	6	6	6	6	77
34	743	722	717	669	595	410	337	269	296	358	394	702	6212
35	91	92	199	118	149	132	93	99	45	65	83	75	1241
36	32	64	138	50	26	13	40	130	25	38	76	88	720
37	74	81	94	93	82	61	58	54	58	75	83	72	885
38	867	870	814	1041	1118	1041	990	898	1208	1031	814	825	11517
39	1524	1564	1361	812	948	928	935	828	853	1014	1182	1342	13291
40	232	229	185	247	236	208	184	166	184	167	170	148	2356
41	408	423	416	337	263	273	292	298	346	378	498	461	4393
42	1484	1403	1362	1708	1782	1568	1602	1390	1228	1274	1858	1297	17956
43	743	373	359	278	293	404	673	634	817	923	921	729	7147
44	145	128	758	1366	2002	2049	1979	1834	2178	2731	2012	557	17739
45	170	205	207	226	242	229	209	213	183	140	154	281	2459
46	494	577	422	267	176	217	178	164	178	194	227	523	3617
47	334	924	1134	1361	1211	1291	1211	1158	1215	1159	399	791	12188
48	353	681	2165	4130	5320	5810	6810	6810	9970	13860	10760	1910	68579
49	68	69	56	57	50	34	32	42	44	37	35	58	582
50	261	331	256	288	245	272	303	368	242	277	395	434	3672
51	1454	1645	3242	3454	3944	3885	3516	3706	3933	4233	2881	2159	38052
52	0	0	0	0	0	0	1538	1231	720	359	338	70	4256
Totals	19056	18692	24811	35725	48934	51106	49797	45485	45385	55701	43661	41490	479840

Table 2. UTAH LAKE SURFACE TRIBUTARY INFLOWS, 1971-72

(All figures are in acre-feet of water)

Tributary Number	1971 July	Aug.	Sept.	Oct	Nov.	Dec.	1972 Jan.	Feb.	March	April	May	June	Totals July-June
1	0	4	15	10	0	0	0	0	0	0	25	8	62
2	0	5	23	0	0	0	0	0	0	0	68	1	97
3	0	0	0	0	0	0	0	0	49	0	0	60	109
4	38	35	22	26	31	32	31	35	30	23	33	39	375
5	22	2	19	15	29	0	37	21	17	12	20	32	226
6	159	115	215	63	64	70	74	63	55	60	112	146	1196
7	68	79	135	194	191	97	92	58	30	57	179	74	1254
8	276	93	298	328	343	310	295	230	178	214	406	351	3322
9	1387	997	1445	1558	1418	1311	1291	1104	1168	916	375	1154	14124
10	215	207	220	217	204	180	178	16	213	274	325	233	2482
11	259	141	107	76	74	77	70	66	70	92	104	164	1300
12	73	96	121	114	90	72	49	38	50	100	168	178	1149
13	63	60	58	57	58	60	61	58	68	83	105	173	904
14	158	231	167	159	133	114	105	89	86	121	149	168	1680
15	123	106	158	178	163	151	129	115	121	135	150	177	1706
16	99	103	98	115	98	94	80	71	90	83	121	114	1166
17	348	377	428	378	249	171	141	123	117	179	375	506	3392
18	1374	1678	2693	2466	2020	1863	1654	1377	1353	1452	1150	1410	20490
19	1	3	0	0	0	0	0	0	0	6	0	0	10
20	1933	1980	2538	2266	2289	2440	2723	2377	2541	2509	2440	2313	28349
21	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	6	6	6	6	12	30	6	0	72
23	0	0	0	0	6	6	6	6	7	7	6	1	45
24	10	13	11	16	21	18	16	15	16	15	15	13	179
25	107	90	45	66	82	103	92	73	61	54	100	78	951
26	262	292	273	245	226	279	290	257	265	266	312	312	3279
27	1210	1270	1240	1380	1440	1420	1500	1480	1540	1450	1530	1320	16780
28	17	3	50	75	122	123	111	104	80	12	55	23	775
29	850	877	1120	15802	20229	20205	16520	16288	20577	16854	16723	29437	175482

Table 2 (Continued) UTAH LAKE SURFACE TRIBUTARY INFLOWS, 1971-72

(All figures are in acre-feet of water)

Tributary Number	1971 July	Aug.	Sept.	Oct.	Nov.	Dec.	1972 Jan.	Feb.	March	April	May	June	Totals July-June
31	104	100	149	137	105	109	123	104	74	89	68	65	1227
32	42	45	40	42	39	42	43	40	49	42	80	125	629
33	3	6	6	6	6	6	7	7	7	7	8	8	77
34	617	354	297	470	242	224	234	224	289	321	301	321	3894
35	46	54	119	211	214	133	148	35	80	125	141	119	1425
36	25	24	60	58	26	30	31	23	25	71	25	24	422
37	75	80	92	95	76	55	49	35	37	60	68	69	791
38	859	947	711	883	868	923	959	892	1008	726	750	684	10210
39	1439	1624	1401	1259	1117	1055	952	944	1128	1141	1325	1466	14851
40	404	255	273	206	169	149	123	29	31	30	18	0	1687
41	313	262	241	245	228	208	215	196	246	303	240	250	2947
42	1529	2057	2116	2241	1940	1468	1279	1294	1457	1743	2060	2338	21522
43	451	414	438	476	468	509	553	506	553	553	584	779	6284
44	149	191	434	1461	1663	1766	1968	1818	2226	2130	92	161	14059
45	341	279	331	424	643	401	357	276	283	315	240	268	4158
46	386	456	274	216	203	191	185	127	178	202	240	292	2950
47	489	835	891	941	1073	823	935	1041	1992	1095	689	238	11042
48	593	538	1700	5343	6389	7289	7329	7525	10320	6926	801	736	55489
49	62	54	39	45	44	40	31	35	37	54	49	48	538
50	333	250	207	180	137	135	172	150	160	184	394	303	2605
51	1043	1156	2559	3063	3793	4013	4034	3664	3419	2600	1636	2172	33152
52	0	0	0	922	2082	1783	1014	2013	680	600	90	0	9184
Totals	18355	18838	23877	44728	51111	50554	46292	45048	53073	44321	34951	48951	480099

Table 3. UTAH LAKE SURFACE TRIBUTARY INFLOWS, 1972-73

(All figures are in acre-feet of water)

Tributary No.	1972 July	Aug.	Sept.	Oct.	Nov.	Dec.	1973 Jan.	Feb.	March	April	May	June	Totals
9	1537	1168	1309	1875	1666	1722	1506	1722	1968	1785	1107	1368	18733
11	129	124	138	143	130	135	143	130	130	140	150	150	1642
18	1599	1568	2410	2767	2350	1875	1783	1805	2029	1577	1844	1785	23392
20	1745	2372	2313	2593	2602	2579	2782	2250	2271	2063	2265	2405	28240
26	314	314	304	295	285	295	295	266	333	313	285	304	3603
27	1210	1270	1240	1380	1440	1420	1500	1480	1540	1450	1530	1320	16780
29	1840	732	2020	11400	13850	14090	16290	16000	17130	20680	41880	19470	175382
34	679	710	533	429	235	191	188	204	334	502	875	1154	6034
38	813	695	632	943	683	1185	1319	1206	1395	1325	678	546	11420
39	1475	1427	1381	1269	933	1135	1009	945	1094	1068	1465	1427	14628
41	286	455	550	524	529	336	240	272	340	374	460	387	4753
42	1020	1072	775	1161	1651	740	526	461	1055	1104	1423	1214	12202
43	861	829	439	689	455	252	144	218	375	371	383	980	5996
47	85	221	416	1072	1133	1156	1128	1137	1270	1187	893	119	9817
48	113	149	762	4950	6320	6450	6550	5730	7300	17090	40150	3480	99044
51	440	336	857	2413	2657	2619	2828	3307	3590	3273	3951	2023	28294
Un-measured tributaries	3721	3416	4331	5429	5734	5978	6100	13800[a]	5612	8653[b]	37029[b]	17339[b]	117142
Totals	17867	16858	20410	39332	42653	42158	44331	50933	47766	62955	136368	55471	577102

[a] February abnormal winter thaw caused considerable un-measured runoff.

[b] Estimated indirectly by evaporation and water balance calculations.

water stage recorders for continuous recording of the stream flow. The flow records are published as "Provo River at Provo, Utah" and "Spanish Fork River near Lakeshore, Utah." Records for these two tributaries were tabulated from U.S.G.S. data.

The effluent from Geneva Steel plant (No. 20) is measured continuously by the steel company, and these records have been made available to the project.

Records of effluent flow from Provo (No. 39), Orem (No. 26), and American Fork (No. 11) sewage treatment plants were obtained from the Utah State Board of Health. Flows from the other sewage treatment facilities in the valley are mingled with other waters before entering the lake, and the entire flow of these tributaries was measured on a regular basis over the period of study. One tributary, Powell Slough (No. 27), consists of several branches in an area where a number of springs arise. Measurement of this tributary presented a number of difficulties. A study of several record sources indicated that rather careful and detailed measurements of this tributary had been made at different times in the past. Swendsen[6] made detailed measurements over a 13-month period in 1903-04. Harding[13] carefully analyzed the Swendsen records and noted minor differences from his own measurements. The Bureau of Reclamation made measurements over an eight-year period, 1938-45. Taking all of the available records of measurements of Powell's Slough, it was noted that for each month of the year, the records of flow from all of these different periods of time did not differ greatly from each other. It was therefore decided that to use a fixed monthly flow equal to the average of the available ten years of record would not be seriously in error. Considering the physical difficulty of getting an actual measurement of this tributary it was felt that the expense of attempting to do so would not be warranted. Since all three years of the study were "good" water years and the lake level was high, the same monthly figure was used for each corresponding month of the three years. Measuring devices were established on all of the other of the fifty-one tributaries. For the first two years of study, measurements were made at all stations weekly during the summer months and about monthly during the other periods of the year, when experience showed that there was relatively little change in flow with time. After the first two years of data were collected, it was noted that many of the small drainage channels which are tributary to the lake are not subject to appreciable fluctuation, except on a predictable seasonal basis. Thirty-five of the fifty-one stations were in this category. These thirty-five stations included numbers 1 through 8, 10, 12 through 17, 19, 21 through 25, 28, 31 through 33, 35 through 37, 40, 44 through 46, 49, 50, and 52. These thirty-five stations represented thirteen percent of the total surface tributary inflow in each of the first two years of the study. It was decided in the third year that these flows could be estimated, using the records of the first two years and the flows from the major tributaries during the third year as a basis for the estimation. It will be noted in Table 3 that an estimated total flow for each month for these thirty-five stations is given.

The estimates of flow for these thirty-five stations during the last half of 1972 were made by comparison with measurements of previous years, and measurements of the other seventeen tributaries which were measured. However, in February an unusual winter thaw occurred which caused a lot of un-measured flow into the lake, which was difficult to evaluate. The spring runoff during 1973 was also abnormally high as shown by flows of the Provo and Spanish Fork River. In view of these conditions, it was decided that the best way to estimate the unmeasured lake tributary inflow was to utilize the water budget method, using sub-surface spring flows and evaporation data and average lake-pan coefficients determined from the first two year's data for each of the months when evaporation pan data were available.

Precipitation Measurement

Precipitation on the lake surface was determined by using the data from regular U.S. Department of Commerce precipitation station records as published in "Climatological Data"[14]; supplemented by stations established by the U.S. Bureau of Reclamation at Pelican Point, Lakeshore, Dixon Farms, and Provo Airport over part of the study period. Average weighted precipitation on the lake surface was determined by using the Thiessen method[15].

Lake Outflow

All of the surface outflow from Utah Lake is through the overflow gates or pumping plant to the Jordan River at the north end of the lake near Lehi, except for a small amount taken by direct pumping from the southwestern portion of the lake near Elberta. The outflows are accurately measured and reported by Gardner[16]. All outflow data used in this study were taken from these reports.

Change in Storage

The change in storage during any time period used in water budget studies may be determined by use of area-capacity data coupled with accurate measurements of the elevation of the lake surface. Water budget calculations in this study were made over monthly time intervals. Determination of the elevation of the water surface of the lake were made from water stage recorder readings at midnight on the last day of each month, with adjustments as necessary to account for seiches caused by wind on the lake surface. Continuous water stage recorder records of the elevation of the water surface of the lake throughout the entire period reported herein were obtained from the Utah Lake and Jordan River Commissioner. Tables giving surface areas and volume of storage for the lake at one-hundredth of a foot intervals were obtained from the U.S. Bureau of Reclamation. The importance of accuracy in determining and evaluating the elevation of the water surface can be emphasized by pointing out that at compromise level, a one-inch (2.54 c.m.) difference in elevation represents a change in storage of nearly 8000 acre feet (9,872,000 cubic meters).

In making calculations by the water budget method, it is worthy of note that over short periods (i.e., monthly) small errors in determining water stage levels may result in considerable errors in the other calculated factors over longer periods (such as one or two years) or during months of high evaporation losses, the small water level errors have only a relatively small effect on the calculations of water budget factors.

Sub-Surface Seepage

The existence of springs in Utah Lake has already been mentioned. The springs along the east shore of the lake from the mouth of Provo River northward are presumed to issue from the shallow Pleistocene Aquifer from which many flowing wells near the lake draw water. This presumption is based upon the similarities in salt content, water pressure, and water temperature between these wells and the sub-surface springs in this area of the lake.

The warm springs which occur in a general line from the vicinity of Saratoga Resort at the north end of the lake to Lincoln Point are presumed to issue from geologic faults in the lake which have much deeper origin. These spring waters are similar in dissolved solids and temperature to the springs at Lincoln Point and Saratoga. They are high in dissolved salts--particularly sodium chloride.

Swendsen[6] and Harding[7] and others[4, 5, 17], have pointed out that the groundwater near the lake is under pressure--sometimes as much as 15 feet of pressure head. It is presumed, therefore, that the net seepage flow is into the lake, and that it occurs primarily in the warm and cold springs mentioned above.

Various estimates have been made of the quantity of flow into the lake in the sub-surface springs. Most investigators have indicated that their estimates are subject to considerable possibility of error. Certainly the amount of flow would decrease as the pressures in the aquifers feeding the springs decreased. It has been noted, however, that even in the extreme drouth years, the water pressure in deep aquifers was probably not diminished significantly. The pressures in the shallow aquifers, being subject to greater development and use, have diminished in time of drouth, or even during short periods of heavy use such as the summer months. In investigations reported in 1964, Viers[18] estimated inflow of 18,300 acre feet (22.6 million cubic meters) annually from known springs, and 67,000 acre feet (82.7 million cubic meters) "unmeasured inflow from the alluvial fans north of the Provo River."

Greene[19] and Jacobsen and Peterson[20], estimated that the "invisible inflow" to Utah Lake is less than 300 cubic feet per second (8.5 cubic meters per second)--this is 217.200 acre feet (268 million cubic meters) annually--with their estimates presumably being based upon the same water budget analysis. Harding[7] reported a number of personal studies and measurements to evaluate all sub-surface spring flow into the lake. He estimated a total average spring flow from known spring areas at 40 to 60 cubic feet per second (1.13 to 1.70 cubic meters per second). An average flow of 60 cubic feet per second represents an annual volume equivalent to about 45,000 acre feet (55.5 million cubic meters). It was decided, as a first approximation, to use 45,000 acre feet as the annual sub-surface flow to the lake for each of the three years of the study reported herein. A somewhat arbitrary flow by months was estimated by assuming monthly fluctuations similar to the normal high-to-low fluctuations in ground water aquifer pressures in the shallow Pleistocene Aquifer at Lehi. Water Quality similar to the shallow Pleistocene Aquifer was also assumed. The first approximation was later adjusted based upon water budget and salt balance studies over the first two years of the study which are described in subsequent paragraphs.

The lake simulation model, described later, indicated that there was more salt and more spring water inflowing into the lake. Balance of the simulation model was achieved when 4324 acre feet (5.34 million cubic meters) of water per month was added as additional sub-surface inflow. Of this added spring flow, 2000 acre feet (2.47 million cubic meters) per month was assumed to have dissolved mineral content similar to the wells of the shallow Pleistocene Aquifer on the east and north shore of the lake. The other 2324 acre feet (2.87 million cubic meters) per month was assumed to have dissolved mineral content similar to the warm springs issuing from the geologic fault zone in the lake already mentioned. The total annual sub-surface spring inflow to the lake was thus estimated at 96,880 acre feet (119.6 million cubic meters) and was considered to be made up of three components--(a) 45,000 acre feet per year (55.5 million cubic meters) with the quantity varying from month to month corresponding to ground water pressures in the shallow Pleistocene Aquifer, and quality similar to this aquifer; (b) 24,000 acre feet (29.6 million cubic meters per year) evenly distributed to each month, and of the same quality as the shallow Pleistocene Aquifer just mentioned; and (c) 2,324 acre feet (2.87 million cubic meters) per month or 27,888 acre feet (34.4 million cubic meters) per year of quality similar to the warm springs issuing from the fault.

Each of the three years of the study reported herein were relatively "good" water years, and it may therefore be assumed that the magnitude of the sub-surface spring inflow would be approximately the same in all three years. The above-adjusted estimate was then used in the water budget analysis to calculate the evaporation term in the water budget equation.

Evaporation From The Lake

Other researchers have given considerable attention to the problems of measuring evaporation from a natural lake. Allen[12] used the water budget, energy budget, and evaporation tanks in carefully controlled studies at Lake Hefner, Oklahoma. Harbeck and others[11], in earlier Lake Hefner studies investigated the use of water budget, energy budget, mass transfer, pan evaporation, and a radiation integration in extensive research investigations. The Lake Hefner studies were the result of much detailed planning[21] in an attempt to find a suitable location where the parameters of the water budget equation could be measured with sufficient accuracy that the evaporation could be determined by this method. At the same time, the data obtained could be used as a base for testing of the use of energy budget and mass transfer methods which had never been possible before.

Prior to the Lake Hefner studies, Rohwer[22] in 1931 reported extensive studies which included careful laboratory measurements under controlled conditions as well as the use of an 85-foot (25.9 meter) diameter concrete tank. Hickox [23] also conducted carefully controlled laboratory studies of evaporation as related to wind, velocity, vapor pressure gradient, water temperature, air pressure and other variables.

Many have attempted to derive empirical equations for evaporation from lakes or reservoirs. These efforts have been handicapped by a lack of actual evaporation information. The same handicap has limited the usefulness of studies aimed at evaluation of the use of evaporation pans. Aside from the work by Rohwer[22] (who correlated pan evaporation with that from the 85-foot tank already mentioned) no studies prior to the Lake Hefner studies had sufficient information on actual measured evaporation to provide meaningful comparisons with pan data or emperical equations. Young[24] and Follansbee[25] projected many records of pan evaporation by using "pan coefficients." Harding[26] studied several lakes in Nevada and California during periods of limited inflow and made calculations of evaporation based on water budget analyses. Many investigators have been tempted to use a pan coefficient, based on measurements over an entire season, to short periods--even sometimes for periods as short as one month. This has resulted in many erroneous estimates of evaporation, since the relationship between lake and pan evaporation changes as the season progresses. In the Lake Hefner studies, the coefficients for the Weather Bureau Class A pan varied from about 0.5 in the early spring to nearly 1.0 in the fall, and greater than 1.0 in the winter months. The seasonal fluctuation is due in part to heat stored in the lake or reservoir waters which increases evaporation from the lake or reservoir in the fall and winter months as the average air temperature decreases.

In the Utah Lake studies reported herein, it was anticipated that evaporation could be calculated by the water budget method--at least during the first two years of the study when extensive measurements of inflowing tributaries were made. The difficulty caused by having two unknowns (evaporation and sub-surface flow) was overcome by making use of the salt balance principle.

Salt Balance Study -

Measurements of dissolved mineral content of the inflowing and outflowing waters and of the lake itself were made at regular intervals. Measurements were made of total dissolved minerals and of the sodium, calcium, magnesium, potassium, bicarbonate, carbonate, sulphate, nitrate, and phosphate ions. The chlorides and sulphates of sodium and potassium do not easily precipitate out of solution at the concentrations existing in Utah Lake. A balance therefore should exist between the inflowing and outflowing quantities of these ions adjusted for changes in the amount in solution in the lake over an appropriate time period, with the water that evaporates leaving the salt behind in solution in the lake waters. A simulation on the computer over the first two years of the study indicated that the evaporation as calculated by the water budget method using Harding's estimate[7] of subsurface inflow to the lake resulted in a large deficiency of sodium, potassium, chloride, and sulphate compared with the actual conditions in the lake over the two-year period.

By increasing the estimated sub-surface spring flows from the spring sources having the greatest concentration of chlorides, sulphates, sodium and potassium ions (and by increasing the evaporation a corresponding amount to keep the water budget in balance); the simulation model was brought into approximate balance, mineral-wise, with the actual lake conditions. The water budget figures, adjusted to achieve salt balance, show the calculated evaporation. These figures are shown in Tables 4 and 5. Since evaporation in the winter months is small and represents the difference between large numbers (inflow, outflow, and change of storage) any small errors are greatly magnified in the calculated evaporation. Therefore, although monthly calculation of evaporation is made for the seven months, April through October, no attempt is made to calculate monthly evaporation during the months of October through March. A total evaporation for these five months is calculated based upon water budget analysis over this five-month period in each of the first two years of the study.

Water Balance - The Third Year -

In the third year of the study, many of the tributary inflows were not measured. During most of the year, the measurements on these tributaries during the first two years provide enough information to enable reasonably accurate estimates of flow in the unmeasured tributaries. In the months of April, May, and June of 1973, a period of extra-ordinarily high runoff occurred, and it was not possible to estimate the flows by this method. Therefore, the evaporation for these months was estimated by using the evaporation pan records at Lehi, Utah, and average coefficients for the months as determined from the records of the first two years. Calculated pan coefficients for the first two years of the study are shown in Table 6. Water budget figures for the third year of the study, (including evaporation data for the months of April, May, and June calculated from average pan coefficients for these months from the first two years of the study) are shown in Table 7.

Table 4. WATER BUDGET ANALYSIS - UTAH LAKE 1970-71

(All figures are in acre-feet of water)

Month	Precipitation on lake surface	Surface inflow	Shallow sub-surface inflow	Deep sub-surface inflow	Surface outflow	Change in storage	Calculated evaporation
July '70	7,254	19,056	4,490	2,324	45,300	-66,248	54,072
August	5,981	18,692	4,490	2,324	50,700	-76,441	57,228
September	15,710	24,811	4,707	2,324	33,400	-26,540	40,692
October	9,705	35,725	5,447	2,324	14,900	+14,128	24,173
November	19,745	48,934	6,149	2,324	8,900	+76,133	
December	12,634	51,106	6,593	2,324	16,900	+30,066	
January '71	6,180	49,794	6,784	2,324	23,100	+47,043	32,033
February	12,007	45,485	6,460	2,324	25,900	+25,196	
March	2,985	45,385	6,937	2,324	31,900	+21,627	
April	16,632	55,701	6,445	2,324	30,000	+27,483	23,619
May	3,833	43,661	5,791	2,324	38,200	-22,764	40,173
June	2,517	41,490	4,707	2,324	40,000	-45,029	56,067
T[illegible]	115,183	479,840	69,000	27,888	359,200	+ 4,654	328,057

Table 5. WATER BUDGET ANALYSIS - UTAH LAKE 1971-72

(All figures are in acre-feet of water)

Month	Precipitation on lake surface	Surface inflow	Shallow sub-surface inflow	Deep sub-surface inflow	Surface outflow	Change in storage	Calculated evaporation
July '71	827	18,355	4,490	2,324	48,000	-84,530	62,526
August	5,151	18,838	4,490	2,324	51,400	-74,340	53,743
September	5,807	23,877	4,707	2,324	36,800	-29,952	29,867
October	10,381	44,728	5,447	2,324	12,900	+38,816	11,164
November	7,814	51,111	6,149	2,324	10,300	+55,521	
December	10,519	50,554	6,593	2,324	15.200	+53,770	
January	354	46,292	6,784	2,324	23,800	+30,486	31,276
February	116	45.048	6,460	2,324	25.800	+23,295	
March	2,445	53,073	6,937	2,324	29,300	+13,121	
April	9,171	44,321	6.445	2,324	25.200	+ 3,761	33,300
May	330	34,951	5,791	2,324	44,800	-50,373	48,969
June	5,239	48,951	4,707	2,324	44,000	-32,215	49,436
Totals	58.154	480,099	69,000	27,888	367,500	-52,640	320,281

Table 6. CALCULATED EVAPORATION[a] FROM UTAH LAKE AND EVAPORATION FROM PAN AT LEHI, UTAH, JULY 1970 - SEPTEMBER 1972.

Month	Average Lake Area (acres)	Calculated Lake Evaporation (acre-feet)	Lake Evaporation (inches)	Pan Evaporation (inches)	Pan Coefficient
1970					
July	92,018	54,072	7.05	9.39	0.75
August	89,940	57,228	7.64	8.82	0.87
September	88,467	40,692	5.52	6.20	0.89
October	88,292	24,173	3.29	3.47	0.95
1971					
April	94,772	23,619	2.99	5.16	0.58
May	94,843	40,173	5.08	6.57	0.77
June	93,817	56,067	7.17	9.16	0.78
July	91,890	62,526	8.17	10.88	0.75
August	89,578	53,743	7.20	9.06	0.79
September	88,096	29,867	4.07	6.84	0.59
October	88,222	11,164	1.52	no data	--
1972					
April	93,982	33,300	4.25	5.17	0.82
May	93,284	48,969	6.30	8.87	0.71
June	92,052	49,436	6.44	9.01	0.72
July	90,270	64,892	8.63	11.72	0.74
August	87,914	51,913	7.09	8.73	0.81
September	83,162	40,279	5.81	6.04	0.96
October	86,055	18,733	2.61	no date	--

[a] Calculated by water budget method.

Table 7. WATER BUDGET ANALYSIS - UTAH LAKE 1972-73

(All figures are in acre-feet of water)

Month	Precipitation on lake surface	Surface inflow	Shallow sub-surface inflow	Deep sub-surface inflow	Surface outflow	Change in storage	Calculated evaporation
July '72	955	17.867	4,490	2,324	51,000	- 90,256	64,892
August	4,542	16,858	4,490	2,324	51,900	- 75,599	51,913
September	5,220	20,410	4,707	2,324	35,485	- 43,103	40,279
October	20,316	39,332	5,447	2,324	13,370	+ 35,316	18,733
November	6,481	42,653	6,149	2,324	5,286	+ 46,240	
December	4,830	42,158	6,593	2,324	1,773	+ 49,623	
January '73	7,410	44,331	6,784	2,324	6,779	+ 54,057	10,987
February	7,189	50,933	6,460	2,324	19,714	+ 47,622	
March	9,542	47,766	6,937	2,324	26,753	+ 39,002	
April	11,784	62,955[a]	6,445	2,324	29,798	+ 30,048	23,662[a]
May	8,964	136,368[a]	5,791	2,324	39,258	+ 65,794	48,395[a]
June	6,106	55,471[a]	4,707	2,324	44,551	- 29,732	53,789[a]
Totals	93,339	577,102	69,000	27,888	325,667	+129,012	312,650

[a] Evaporation during April, May, and June was calculated from pan evaporation data at Lehi, Utah, and surface inflow calculated by water budget, since surface inflow measurements not available for these months.

SECTION VIII

COMPUTER SIMULATION

A Fortran IV computer program, LKSIM, was developed to allow simulation of the conservative salts in a well-mixed lake system. This model (1) carries along the salt concentrations as well as the water budget, thus allowing the user to evolve better estimates of evaporation and sub-surface inflow; and (2) provides the capability to predict changes in water quality and the water budget resulting from various management alternatives, such as (a) diking, (b) changes in tributary inflow quantity and/or quality, (c) and diked bay management policies.

The simulation model is based on the concept of a central main lake which has satellite bays connected to it. During each time period of the simulation, normally one month, the given inflows, outflows, precipitation and evaporation are evaluated for each area; the total quantities of inflowing salts are calculated and added to each area; and the end-of-period water volume and quality determined assuming that each area is a separate, well-mixed body of water. The imaginary gates separating the bays from the main lake are then "opened" and the volume of interflow occurs as necessary to bring the entire lake system to the same stage. This lake stage is the dependent variable since all other water quantities are given as input data. Circulation between the main lake and any bays is simulated at this point by also allowing the exchange of a specified percentage of a bay's volume with lake water. These flows are then completely mixed in the recipient areas. The end-of-period water quantity and quality summary is then printed and the next time period begins.

Diking is simulated by leaving the imaginary gates closed, thus leaving the diked area as a separate lake. Many options are possible for management of the diked area, for example:

(1) Any or all bay tributaries may be reassigned to another bay or to the main lake. This allows simulation of diversion of water around the diked bay or pumpage of tributary inflow over the dike.

(2) Any desired beginning bay stage may be given, thus representing various degrees of pumpage from the bay after dike completion. Any such pumpage would be simulated by assigning it as a tributary inflow during an early time period(s).

(3) If a given maximum stage is exceeded in the main lake in any period, the excess water may be allowed (coded) to flow into a diked bay area or else be exported out of the lake system, etc. Refer to Section XIII, Appendix B for specific details on these and other model options.

Although the LKSIM simulation model is conceptually quite simple, it provides a powerful tool for the evaluation of the water balance and dissolved salt concentrations in a lake system. The model does not presently incorporate non-conservative quality parameters--all are assumed to be conservative--and it would be difficult to do so for most parameters. This difficulty stems more from the general dearth of understanding of factors as: (a) chemical precipitation, (b) circulation patterns, (c) energy balances, and (d) biological cycles; than from inherent difficulties in the model itself.

Since the simulation model assumes well-mixed sub-areas, the quality calculated is, at best, the average for each part of the real lake system. Any quality gradient between the main lake and a bay is likewise lumped at the imaginary boundary between them.

When applying the model to a lake system, many judgments and estimates must be made, such as: (a) average beginning salt concentrations, (b) circulation for each period, (c) time period step to be used. When the model is used in conjunction with a detailed knowledge of the real system, and compared to the observed lake quality during the calibration period, it greatly increases the probability of accurately establishing the major unknown components in the water balance budget. The "calibrated" model then also provides a powerful tool for evaluating responses to changes in the lake system.

SECTION IX

DISCUSSION OF RESULTS

The computer simulation of the lake system was described in the previous section and in Appendix B. This simulation served as a valuable tool in the evaluation of evaporation losses from the lake over the study period, as already described in previous sections of this report. The salt balance technique, utilizing the "conservative" ions which are least subject to precipitation out of solution, should prove valuable to other investigators who may be interested in the evaluation of evaporation from lakes and reservoirs. Details of the methodology involved can be noted by careful study of the detailed simulation reproduced in Appendix B. The simulation presented there is actually the end product of a number of successive preliminary simulations with appropriate adjustments made successively to bring about the evolution of the simulation presented.

The capability of simulation of the lake and tributary system in a computer model permits many kinds of analyses. The analysis presented herein relates to consideration of the diking of two bays of the main lake. Innumerable variations in management are possible using the LKSIM model. Considerable data are generated by the model. It is noted that the simulated water quality, as indicated by total dissolved solids and nine different ions, is determined on a monthly basis throughout the study period. A brief summarization of the results of the detailed simulation (shown in Appendix B) is presented in Table 8. In addition to simulated water quality data at the end of the 36-month study period,

Table 8. SUMMARY OF SIMULATION RESULTS - UTAH LAKE AS AT PRESENT

```
***SUMMARY INFORMATION FOR TIME PERIOD 36     --  MONTHS

*** PERIOD FLOWS AND INTERFLOWS

     BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
   NAME  NO.  AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
 MAIN LK   1   3139.   34634.    11589.     641161.       -689.  4489,33    61450.    641850.
 PROVO B   2    274.    4002.     5827.      31059.       4215.  4489,33     6928.     26645.
 GOSHEN B  3   2719.   15246.      535.     226169.      -3526.  4489,33    26640.    229695.

TOTAL SYSTEM      6131.   53883.    17951.                  LAKE     4489,33    95210.   898390.


*** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4      NO3     PO4
MAIN LK    1    960.19   121,90    88,16    44,70   16,61   189,21   328,62   172,68    6,61    2,42
PROVO B    2    747,00    63,12    92,15    34,99   11,81    71,82   391,26   143,40    2,99    3,07
GOSHEN B   3   1201,92   162,37   100,22    56,43   21,19   261,66   387,19   225,23    5,30    2,04

***WATER BALANCE FOR THE SIMULATION

          BAY  PRECIP    EVAP   TRIB INFLOW      BEGINNING        ENDING
               AC-FT    AC-FT     AC-FT      STAGE   VOLUME   STAGE   VOLUME
MAIN LK    1  161951,  633970, 1521799,    4488,58 595789,0 4489,33 641850,1
PROVO B    2   19050,   63356.  266885,    4488,58  21771,5 4489,33  26844,5
GOSHEN B   3   81293.  268882,   39025,    4488,58 209400,7 4489,33 229695,1

      ***TOTAL LAKE  --  AC-FT   (EXCLUDING DIKED BAYS, IF ANY)
   TOTAL PRECIPITATION=   262293,6
   TOTAL EVAPORATION  =   966207,6
   TOTAL TRIB, INFLOW =  1827709,1
   TOTAL TRIB, OUTFLOW= -1052366,4
   OTHER OVERFLOW     =        0,0 (ENDING VOLUME HAS BEEN ADJUSTED FOR OVERFLOW)
   BEGINNING  VOLUME  =   826961,1      STAGE= 4488,58
   ENDING  VOLUME     =   898389,8      STAGE= 4489,33
```

the summary also shows a water balance analysis for the entire 36-month period. The computer printout, reproduced on Appendix B, also displays these data in graphical form showing variations throughout the study period. Comparison of these simulated values with actual measurements at various times indicates the salt balance characteristics. Figures 3, 4, and 5 show comparisons between simulated and observed concentrations of sodium ions, chloride ions, and total dissolved solids in Utah Lake over the three-year period of the study.

Many other simulations have been generated for different input and management conditions. One which is most pertinent to the present study is one in which Provo Bay and Goshen Bay were assumed to have been separated from the main body of the lake by diking. For this "diked" simulation, all of the Provo Bay tributaries were diverted around the bay and into the lake, and all of the Goshen Bay tributaries continued to flow into Goshen Bay. All of the areas started at the same July 1, 1970 stage, and no water was pumped out of the bays into the lake. When the lake level exceeded compromise level, the excess water was "exported" out of the system. A summary of results of the computer simulation are shown in Table 9. It may be noted from the summary that a net saving of 220,000 to 270,000 acre feet (271 to 331 million cubic meters) of water was made over the three-year period--the exact value being dependent upon whether the Goshen Bay tributaries are also diverted to the main lake. It may also be noted that the total dissolved solids of the main lake would be reduced from 960 to 800 milligrams per liter by comparing the undiked simulation results to the diked simulation results. Diking would reduce sodium concentration from 122 to 95 milligrams per liter, and chloride from 189 to 138 milligrams per liter.

It should be pointed out in passing that while some of the quality parameters shown in the simulation (for example, sodium, potassium, and chloride) would be expected to correspond to actual measured values; others (such as calcium, bi-carbonate, nitrate, phosphates, and total

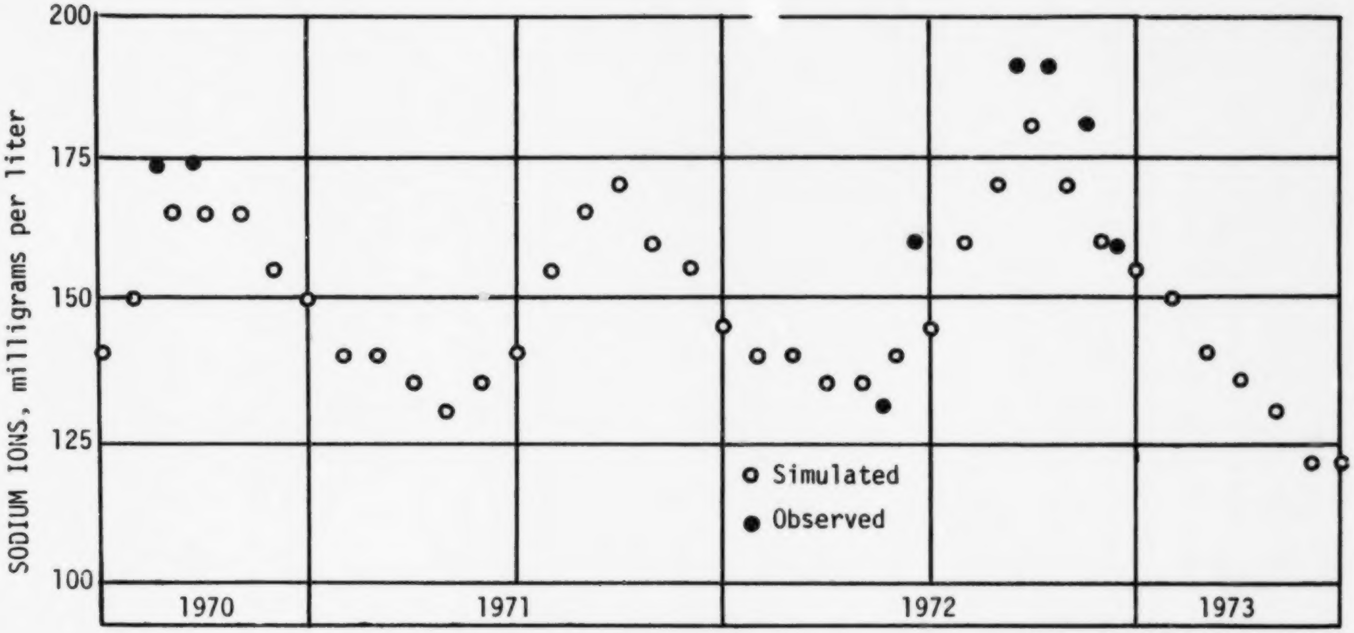


Figure 3. Graph showing simulated and observed concentration of sodium ions in Utah Lake - July 1970 to July 1973

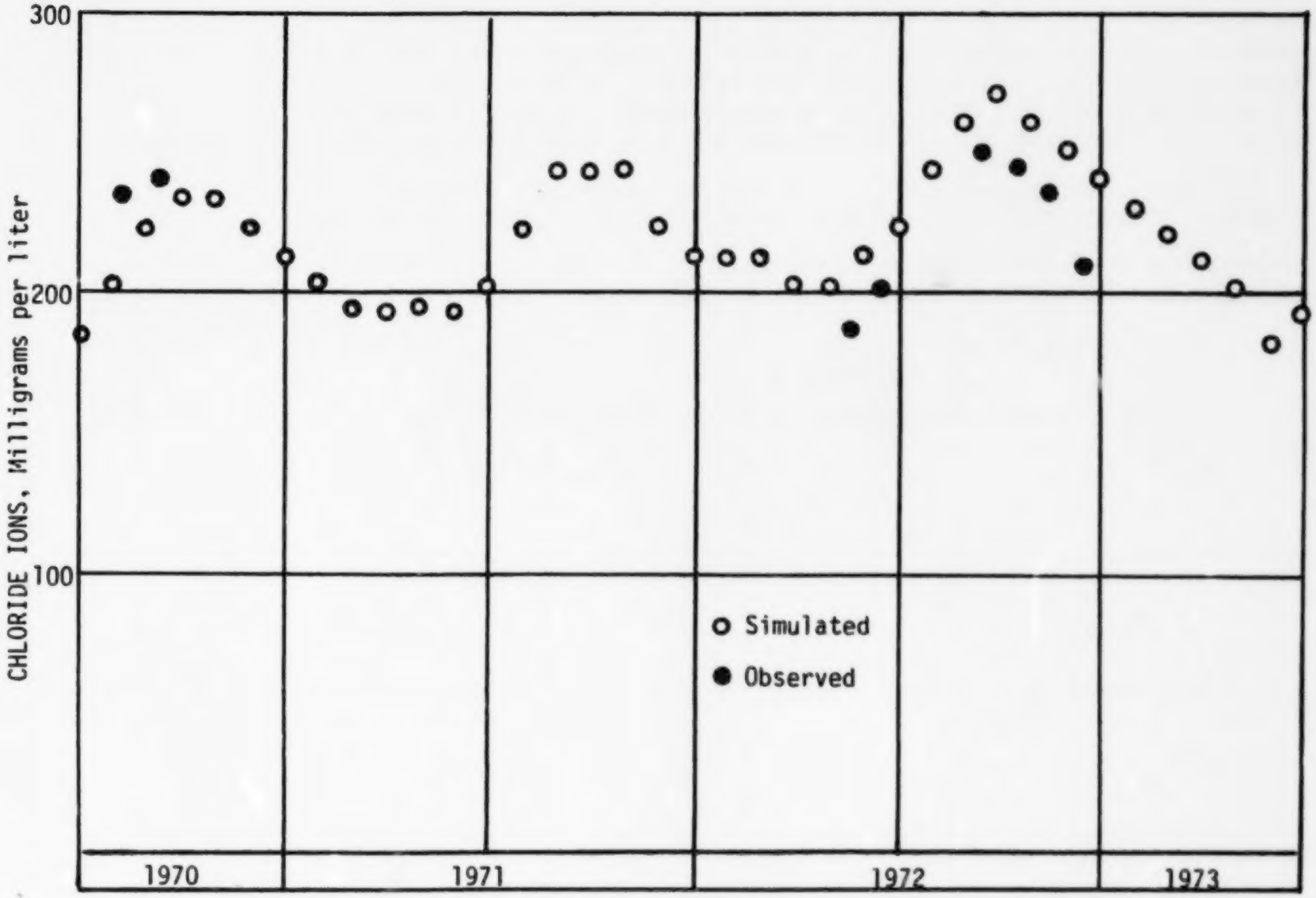


Figure 4. Graph showing simulated and observed concentration of chloride ions in Utah Lake - July 1970 to July 1973

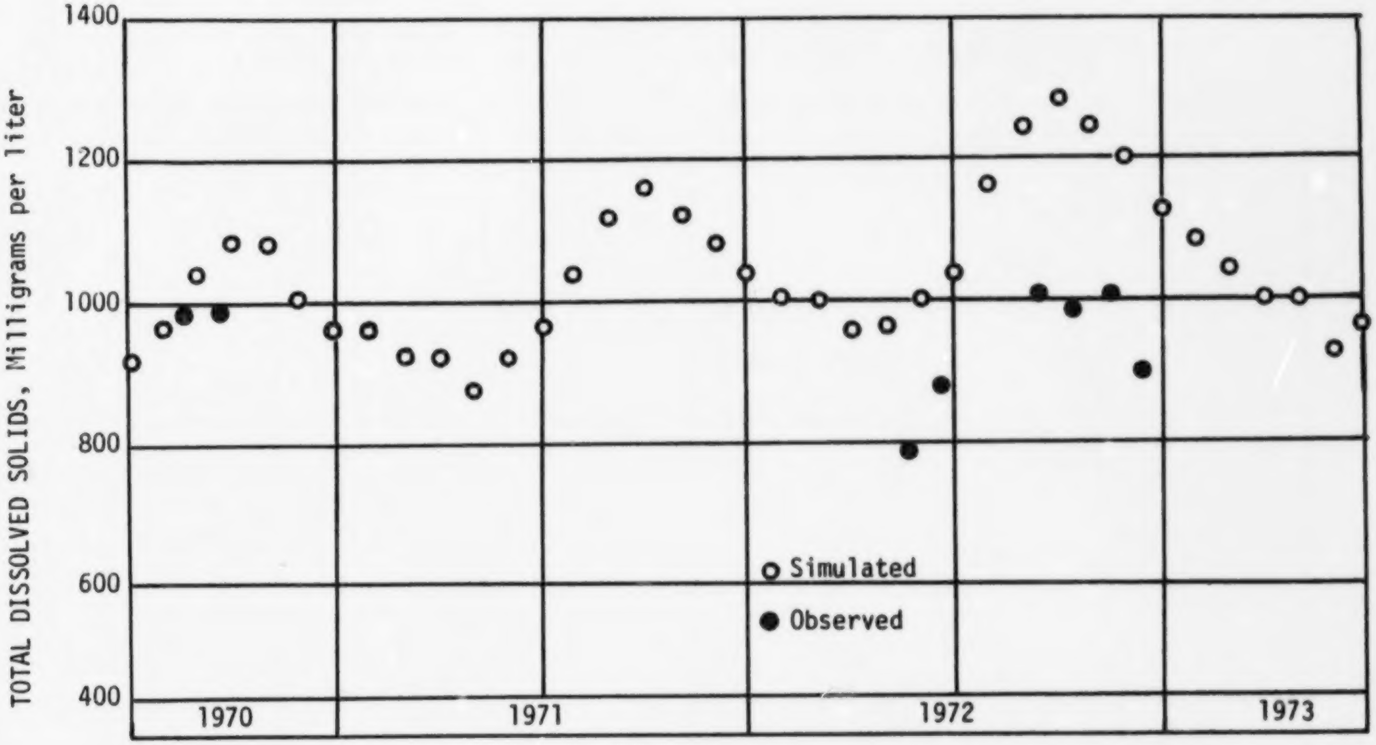


Figure 5. Graph showing simulated and observed concentration of total dissolved solids in Utah Lake - July 1970 to July 1973

Note: The simulated TDS results have not been corrected for apparent precipitation of $CaCO_3$ from the water. Rough estimates of this precipitation based on analysis of calcium and bicarbonate ions would decrease the simulated total dissolved solids to near observed values in 1972. (About 100 mg/l decrease)

Table 9. SUMMARY OF SIMULATION RESULTS - WITH DIKES ON PROVO BAY AND GOSHEN BAY

```
   ***SUMMARY INFORMATION FOR TIME PERIOD 36     -- MONTHS

   *** PERIOD FLOWS AND INTERFLOWS

       BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW     F I N A L
    NAME  NO,   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
  MAIN LK   1   3123.   34455.   17416.     628521.          0,  4489,12    61220,   628521,
  PROVO B   2     46.     668,       0,        493,          0,  4482,60      521,      493,
  GOSHEN B  3   2082,   11678,     535,      77395,          0,  4482,88    20216,    77395,

 TOTAL SYSTEM      5251,  46801,    17951,                   LAKE    4489,12    61220,   628521,


  *** WATER QUALITY AT THE END OF THE PERIOD

         BAY    TDS       NA        CA        MG        K        CL       HCO3     SO4       NO3       PO4
 MAIN LK   1   799,64    94,59     82,46     36,94     13,57   138,00   301,75   136,14     6,90      2.46




  ***WATER BALANCE FOR THE SIMULATION

         BAY  PRECIP    EVAP  TRIB INFLOW      BEGINNING        ENDING
              AC-FT    AC-FT     AC-FT     STAGE   VOLUME    STAGE   VOLUME
 MAIN LK   1  162445,  635542, 1777751,    4488,58 595789,0 4489,12 628520,6
 PROVO B   2   15120,   47331,   10933,    4488,58  21771,5 4482,60    493,2
 GOSHEN B  3   74987,  246018,   39025,    4488,58 209400,7 4482,88  77395,0

       ***TOTAL LAKE  --  AC-FT   (EXCLUDING DIKED BAYS, IF ANY)
   TOTAL PRECIPITATION=   162445,2
   TOTAL EVAPORATION  =   635542,3
   TOTAL TRIB, INFLOW =  1777751,1
   TOTAL TRIB, OUTFLOW= -1052366,4
   OTHER OVERFLOW     =   219555,9 (ENDING VOLUME HAS BEEN ADJUSTED FOR OVERFLOW)
   BEGINNING  VOLUME  =   595789,0     STAGE= 4488,58
   ENDING  VOLUME     =   628520,6     STAGE= 4489,12
```

dissolved solids would not--for at least two reasons: (1) chemical precipitation of several compounds, especially calcium carbonate, and (2) biological activity such as algae growth and decay which results in uptake and release of nutrients such as nitrates and phosphates. The quantities of these nonconservative ions that are trapped or removed in the lake may be estimated by calculating the difference between the observed and the simulated levels at the end of the simulation period. Using this approach, the model is calibrated using the conservative ions and then used to estimate nonconservative ion removal. Several other important factors in relation to the effects of diking should be mentioned. The authors have already previously reported[27] that Provo Bay is presently functioning as a large oxidation pond which has considerable effect upon the reduction of pollution parameters within the bay. If the waters now tributary to the bay were diverted to the main lake, some pre-treatment would be necessary to maintain the present lake quality, particularly near the inflow area.

The research reported herein was not directed toward a detailed study of biological factors, but Barnes, et. al.,[28] have reported several recommendations relating to the precautions which should be taken to limit the possible adverse effects of the proposed Goshen Bay dike on the biota of the lake.

SECTION X
REFERENCES

1. Meyers, J. Stuart. Evaporation From the Seventeen Western States. U.S. Geological Survey, Washington, D.C. Professional Paper 272-D. 1962. 30 p.

2. Water Resources Scientific Information Center. Evaporation Suppression A Bibliography. Office of Water Resources Research, U.S. Department of the Interior, Washington, D.C. Publication Number WRSIC-73-216. December 1973. 477 p.

3. Bureau of Reclamation. Bonneville Unit - Central Utah Project. U.S. Department of the Interior. Government Printing Office, Washington, D.C. 1968.

4. Hunt, C. B., H. D. Varnes, and H. E. Thomas. Lake Bonneville: Geology of Northern Utah Valley, Utah. U.S. Geological Survey, Washington, D.C. Professional Paper 257-A. 1953. 99 p.

5. Bissell, Harold J. Lake Bonneville: Geology of Southern Utah Valley, Utah. U.S. Geological Survey, Washington, D.C. Professional Paper 257-B. 1963. 30 p.

6. Swendsen, George L. Operations in Utah. In: Third Annual Report of the Reclamation Service, 1903-4. U.S. Geological Survey, Department of the Interior, Washington, D.C. 1905. p. 494-508.

7. Harding, S. T. Springs Rising Within the Bed of Utah Lake. Unpublished Report of Investigations for Board of Canal Presidents of the Associated Canals of Salt Lake County. April 1941.

8. Subitzky, Seymour. Records of Selected Wells and Springs, Selected Drillers' Logs of Wells and Chemical Analyses of Ground and Surface Waters - Northern Utah Valley, Utah County, Utah. U.S. Geological Survey, Salt Lake City, Utah. Basic-Data Report No. 2. 1962. 14 p.

9. Mundorff, J. C. Major Thermal Springs of Utah. Utah Geological and Mineralogical Survey, Salt Lake City, Utah. Water Resources Bulletin 13. September 1970. 60 p.

10. Milligan, J. H., R. E. Marsell, and J. M. Bagley. Mineralized Springs in Utah and Their Effect on Manageable Water Supplies. Utah Water Research Laboratory, Utah State University, Logan, Utah. Report WG23-6. September 1966. 50 p.

11. U.S. Geological Survey. Water-Loss Investigations: Volume I - Lake Hefner Studies Technical Report. U.S. Department of the Interior, Washington, D.C. Circular 229. 1952. 153 p.

12. Allen, James B. An Analysis of Evaporation at Lake Hefner, 1965-66, Based on the Water Budget, Energy Budget, and Evaporation Tanks. Department of Agricultural Engineering, Oklahoma University, Stillwater, Oklahoma. Doctoral Thesis. July 1968. 208 p.

13. Harding, S. T. Inflow to Utah Lake 1903-04 and 1935-36. Unpublished Report of Investigations for Board of Canal Presidents of the Associated Canals of Salt Lake County. 1936. 24 p.

14. Environmental Data Service. Climatological Data - Utah. National Oceanic and Atmospheric Administration, Asheville, North Carolina. Volumes 72-75. 1970-73.

15. Thiessen, A. H. Precipitation for Large Areas. Monthly Weather Review, 39: 1082-1084, July 1911.

16. Gardner, David B. Utah Lake and Jordan River Distribution. Annual Report of the Utah Lake and Jordan River Commission for the Years 1970-73, inclusive, Salt Lake City, Utah. p. 19-21.

17. Richardson, G. B. Underground Waters in Valleys of Utah. U.S. Department of the Interior, Geological Survey, Washington, D.C. Water Supply Paper 1957. 1906. p. 29, 49.

18. Viers, C. E. The Chemical Quality of the Waters of Utah Lake. U.S. Department of the Interior, Bureau of Reclamation, Region 4, Salt Lake City, Utah. Unpublished Report. May 1964. 106 p.

19. Greene, W. M. Utah Lake Division of the Salt Lake Basin Investigation. U.S. Bureau of Reclamation. Unpublished Report. May 1923.

20. Jacobsen, C. B., and W. F. Peterson. Utah Lake, A Storage Reservoir. University of Utah, Salt Lake City, Utah. Unpublished B.S. Thesis. May 1932.

21. Harbeck, G. E. Utility of Selected Western Lakes and Reservoirs for Water Loss Studies. U.S. Geological Survey, Washington, D.C. Circular No. 103. March 1951.

22. Rohwer, C. Evaporation from Free Water Surfaces. U.S. Department of Agriculture, Washington, D.C. Technical Bulletin No. 271. December 1931.

23. Hickox, G. H. Evaporation from a Free Water Surface. American Society of Civil Engineers, Transactions, 111(Paper 2266): 1-33, 1946.

24. Young, A. A. Evaporation from Water Surfaces in California. Division of Water Resources, Department of Public Works, State of California, Sacramento, California. Bulletin No. 54. 1947. 68 p.

25. Rohwer, C., and R. Follansbee. Evaporation from Water Surfaces: A Symposium. American Society of Civil Engineers, Transactions, 99: 671-747, 1934.

26. Harding, S. T. Evaporation from Large Water Surfaces Based on Records in California and Nevada. American Geophysical Union, Transactions, 16(Part 2): 507-511, 1935.

27. Barnes, J. R., T. W. Toole, D. L. Tillman, and D. K. Shiozawa. The Effect of Goshen Bay Dike on the Benthos of Utah Lake in Relation to Water Quality. Department of Zoology and Center for Health and Environmental Studies, Brigham Young University, Provo, Utah. Final Project Report. 1974.

28. Fuhriman, D. K., J. R. Barton, L. B. Merritt, and J. S. Bradshaw. The Diking of Arid Region Lakes to Improve Water Quality. In: Water--1973. American Institute of Chemical Engineers, 345 East 47th Street, New York, New York 10017. 1974. Symposium Series Vol. 70, Number 136. p. 629-637.

SECTION XI
INVENTIONS, PUBLICATIONS, TECHNICAL PAPERS

INVENTIONS

No inventions have been produced on this project.

PUBLICATIONS

Kennison, L. T., J. S. Bradshaw, D. R. Pratt, E. L. Loveridge, D. K. Fuhriman, and J. R. Barton. Eutrophication of Utah Lake--An Initial Estimate of Nutrient Inflow. Utah Academy of Sciences, Arts and Letters. Proceedings 48 (Part 1): 52-55. October 1971.

Bradshaw, J. S., E. L. Loveridge, K. P. Ripee, J. F. Brown, E. M. Michener, B. Hague, J. L. Peterson, D. K. Fuhriman, J. R. Barton, and D. A. White. Pesticides in the Water and Fish of Utah Lake and Its Tributaries. Utah Academy of Sciences, Arts and Letters. Proceedings 48 (Part 2): 26-32. October 1971.

Bradshaw, J. S., E. L. Loveridge, K. P. Ripee, J. L. Peterson, D. A. White, J. R. Barton, and D. K. Fuhriman. Seasonal Variations in Residues of Chlorinated Hydrocarbon Pesticides in the Water of the Utah Lake Drainage System--1970 and 1971. Pesticides Monitoring Journal, 6(3): 166-170, December 1972.

Bradshaw, J. S., R. B. Sundrud, D. A. White, J. R. Barton, D. K. Fuhriman, E. L. Loveridge, and D. R. Pratt. Chemical Response of Utah Lake to Nutrient Inflow. Journal Water Pollution Control Federation, 45: 880-887, May 1973.

Fuhriman, D. K., J. R. Barton, L. B. Merritt, and J. S. Bradshaw. The Diking of Arid Region Lakes to Improve Water Quality. In: Water--1973. American Institute of Chemical Engineers, 345 East 47th Street, New York, New York 10017. 1974. Symposium Series Vol. 70, Number 136. p. 629-637. (This paper also presented at 74th National Meeting of AIChE, New Orleans, Louisiana in March 1973.)

GRADUATE STUDENT THESES, PROJECT REPORTS AND DISSERTATIONS

Kennison, Lynn. Eutrophication of Small Lakes. Master of Science Thesis. Department of Chemistry, Brigham Young University, Provo, Utah. May 1971.

Morrison, G. Mark. A Survey of Summer and Winter Water Quality Conditions of Provo Bay. Master of Civil Engineering Project Report. Brigham Young University, Provo, Utah. August 1971.

Sundrud, R. Bruce. The Biochemical Response of Provo Bay to Nutrient Inflow. Master of Science Thesis. Department of Zoology, Brigham Young University, Provo, Utah. August 1971.

Riley, James A. Utah Lake Water Budget Study--1970-71. Master of Civil Engineering Project Report. Brigham Young University, Provo, Utah. February 1972.

Loveless, Eric G. Utah Lake Water Budget Study--June 1970 through December 1971. Master of Civil Engineering Project Report. Brigham Young University, Provo, Utah. May 1972.

Nelson, James D. Utah Lake Water Quality Study--1968-1972. Master of Civil Engineering Project Report. Brigham Young University, Provo, Utah. December 1972.

Stock, Harold S. A New Approach to Evaporation Estimation by Combining Water Budget and Salt Balance Techniques. Ph.D. Dissertation. Brigham Young University, Provo, Utah. In preparation 1974.

TECHNICAL PAPERS PRESENTED

Fuhriman, D. K., and J. R. Barton. Utah Lake Pollution Research. Utah Section, American Society of Civil Engineers, Salt Lake City, Utah. October 1970.

Fuhriman, D. K., James R. Barton, and Jerald S. Bradshaw. Diking Research on Utah Lake. B.Y.U. Chapter, Sigma Xi, Provo, Utah March 1971.

Tillman, David S. The Biochemical Oxygen Demand and Coliform Bacteria Counts of Utah Lake. Utah Academy of Sciences, Arts and Letters, Provo, Utah. October 1970.

Sundrud, R. B., M. Morrison, D. R. Pratt, E. L. Loveridge, J. S. Bradshaw, D. A. White, J. R. Barton, and D. K. Fuhriman. The Biochemical Response of Provo Bay to Nutrient Inflow. Utah Academy of Sciences, Arts and Letters, Ogden, Utah. April 1971.

Kennison, L. T., J. S. Bradshaw, D. R. Pratt, E. L. Loveridge, D. K. Fuhriman, and J. R. Barton. Eutrophication of Utah Lake--An Initial Estimate of the Nutrient Inflow. Utah Academy of Sciences, Arts and Letters, Ogden, Utah. April 1971.

Pratt, D. R., and J. S. Bradshaw. Water Chemistry of Utah Lake. Utah Lake Research Symposium, Provo, Utah. February 1971.

Bradshaw, J. S., R. B. Sundrud, L. T. Kennison, E. L. Loveridge, D. R. Pratt, D. A. White, D. K. Fuhriman, and J. R. Barton. The Chemical Response of Utah Lake to Nutrient Inflow. Northwest Regional Meeting of American Chemical Society. Bozeman, Montana. February 1971.

Morrison, Mark, J. S. Bradshaw, James R. Barton, and D. K. Fuhriman. Dissolved Solids in Utah Lake. Utah Academy of Sciences, Arts and Letters, Provo, Utah. October 1970.

Loveless, Eric, D. K. Fuhriman, J. R. Barton, and J. S. Bradshaw. Water Budget Studies of Utah Lake. Utah Academy of Sciences, Arts and Letters, Provo, Utah. October 1970.

Loveridge, E. L., J. S. Bradshaw, J. R. Barton, and D. K. Fuhriman. Pesticide Levels in the Tributaries to Utah Lake. Utah Academy of Sciences, Arts and Letters, Provo, Utah. October 1970.

Bradshaw, J. S., E. L. Loveridge, K. P. Ripee, J. F. Brown, E. M. Michener, B. Hague, J. L. Peterson, D. K. Fuhriman, J. R. Barton, and D. A. White. Pesticides in the Water and Fish of Utah Lake and Its Tributaries. Utah Academy of Sciences, Arts and Letters, Provo, Utah. October 1970.

Fuhriman, D. K., J. R. Barton, L. B. Merritt, and J. S. Bradshaw. The Diking of Arid Region Lakes to Improve Water Quality. 74th National Meeting, American Institute of Chemical Engineers. New Orleans, Louisiana. March 1973.

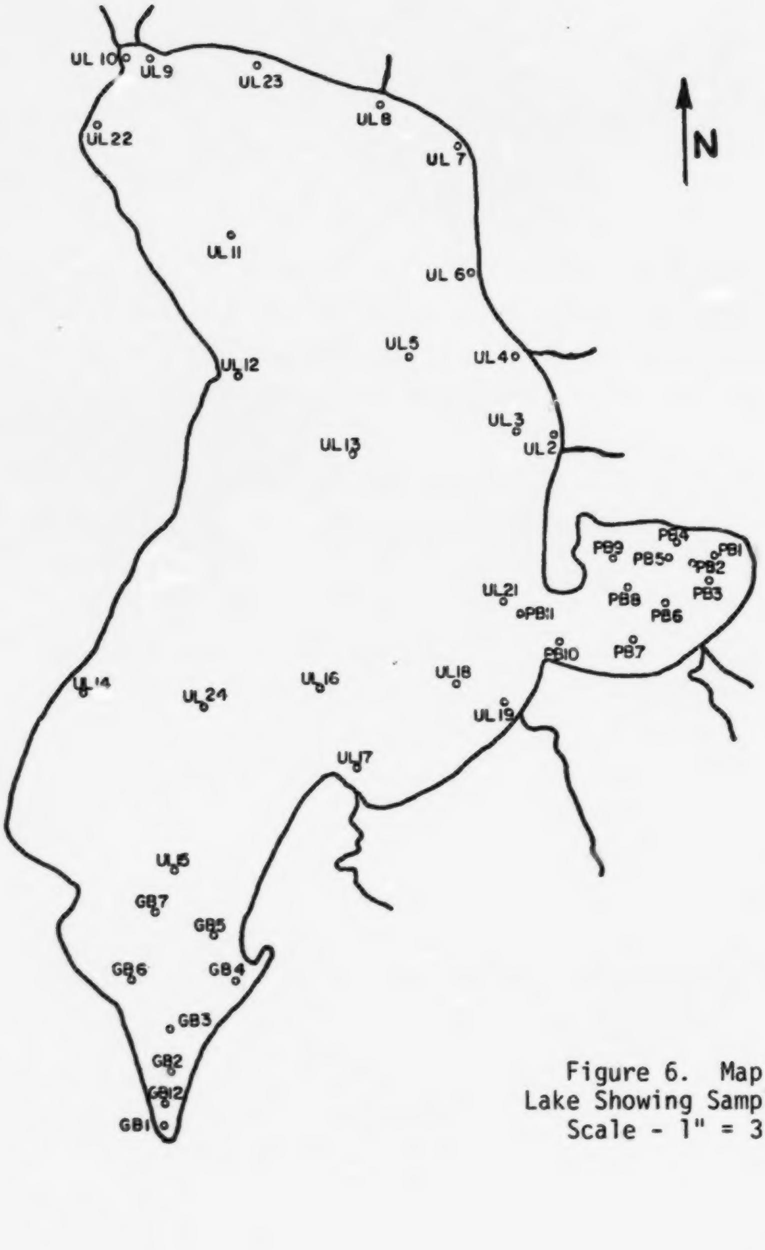
SECTION XII

APPENDIX A

In this section, a complete computer print-out is given for all lake and tributary quality sampling results and many of the quantitative flow measurements of tributaries, particularly for those made at the same time a quality sample was taken. See pages 56 to 98 inclusive.

Preceding the computer print-outs are maps showing the location of all sampling stations and an explanation sheet of nomenclature used in the data listing.

The tabulation of data is presented chronologically for each sampling station in order of number, except for some supplemental data obtained from the U.S. Bureau of Reclamation for the period September 1972 to June 1973 which is presented on the last three pages of the data listing.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UL9
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UL22
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UL11
UL 6
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UL4
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UL3
UL2
UL13
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PB9
PB5
PB1
PB2
PB3
UL21
PB8
PB6
PB11
PB10
PB7
UL14
UL24
UL16
UL18
UL19
UL17
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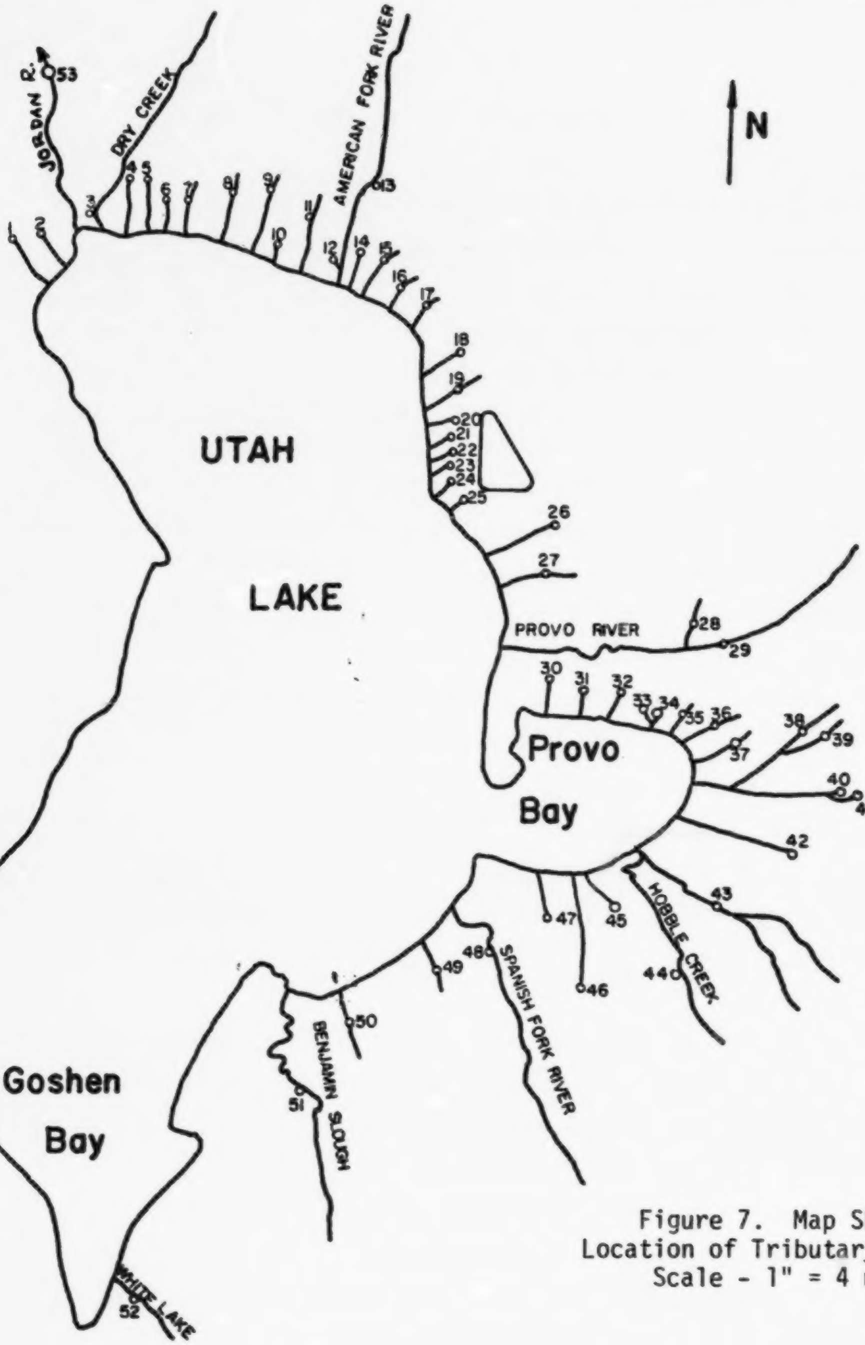
Figure 6. Map of Utah Lake Showing Sampling Stations
Scale - 1" = 3.33 miles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JORDAN R.
53
DRY CREEK
AMERICAN FORK RIVER
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12
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UTAH
LAKE
PROVO RIVER
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29
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Provo
Bay
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HOBBLE CREEK
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SPANISH FORK RIVER
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BENJAMIN SLOUGH
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Goshen
Bay
WHITE LAKE
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Figure 7. Map Showing
Location of Tributary Stations
Scale - 1" = 4 miles

NOMENCLATURE USED IN THE DATA LISTING

AL = Alkalinity - reported as mg/liter calcium carbonate

BOD = Biochemical oxygen demand - 5 day 20 degree C

CA = Calcium - reported in mg/liter

CL = Chloride - reported in mg/liter

CO3 = Carbonate - reported as mg/liter

COLF = Coliform bacteria - measured either as actual number or most probable number per 100 ml of sample

COND = Conductivity measured in micromhos/cm

DS = Dissolved solids - total soluble salts measured in mg/liter

F = Fluoride - reported in mg/liter

FLOW = Flow rate in cubic feet per second

GB = Goshen bay stations

HARD = Hardness of the water reported as mg/liter calcium carbonate

HCO3 = Bicarbonate - reported as mg/liter

K = Potassium - reported in mg/liter

MG = Magnesium - reported in mg/liter

NA = Sodium - reported in mg/liter

NH3 = Nitrogen present as ammonia - reported as mg/liter nitrogen

NO3 = Nitrogen present as nitrate - reported as mg/liter nitrogen

PB = Provo bay stations

PH = Negative log of hydrogen ion concentration in moles/liter

PO4 = Ortho phosphate - reported as mg/liter phosphorus

SO4 = Sulfate - reported as mg/liter

TEMP = Water Temperature - degrees C

TURB = Turbidity reported in Jackson turbidity units

UL = Utah Lake stations

UT = Tributaries to Utah Lake including Jordan River outflow

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
51072	UT 1		14.0		432	187	204	050	57	15	9	229		010		1.38		0.44			04.6		372	
51072	UT 2		15.0		410	180	195	014	57	13	06	220		005		0.37		0.09			01.5		315	
82669	UT 3		26.7	8.70																		08.8		048
90269	UT 3		22.9																			07.4		042
90969	UT 3		24.5	8.50																		12.3		028
30570	UT 3			7.40	1310	485	539	70	99	71	2	591	0.8	85	163	0.11				2300	3.5			
60270	UT 3			8.15	475	209	231	17	58	21	2	251	2.0	20	29	0.32								
20271	UT 3		4.0	8.90	649											1.70		0.44				7.0	424	
31672	UT 4	0.62	11.0			225	431	072	125	29	01	275		032	305	1.80		0.03			00.8		841	
32372	UT 4	0.70	10.0			132	507	041	157	28	02	162		026	136	1.38		0.03			00.5		523	
33072	UT 4	0.02	12.0			291	369	045	100	29	02	356		030	098	1.74		0.03			01.0		662	
40572	UT 4	0.54	11.5		605		246	041	51	29	14			029		1.66		0.07			00.4			
41372	UT 4	0.42	08.2		648	341	412	047	119	28	02	417		029	099	1.60		0.03			00.6		0742	
41972	UT 4	0.37	07.5			340	376	042	106	27	01	415		030		1.55							0590	
50372	UT 4	0.32	09.0																					
51072	UT 4	0.44	13.0		475	163	221	027	54	21	05	200		019		0.12		0.17			02.2		326	
32372	UT 5	0.20	12.0			205	281	025	78	21	03	251		017	042	0.80		0.16			02.4		438	
33072	UT 5	0.24	15.0			237	293	020	83	21	02	290		020	045	0.74		0.04			00.6		482	
40572	UT 5	0.22	12.0		356		148	016	28	19	01			022		0.68		0.06			00.1			
41372	UT 5	0.26	04.5		475	231	250	016	69	19	02	282		017	042	0.88		0.07			01.8		448	
41972	UT 5	0.22	04.0			204	214	016	58	17	02	249		015		0.68		0.02			00.8		400	
50372	UT 5	0.20	11.0																					
51072	UT 5	0.44	14.5		250	286	365	024	72	45	02	349		012		0.73		0.06			00.6		650	
31672	UT 6	1.06	12.0			331	386	036	92	38	07	404		035	072	2.70		0.13			04.0		687	
32372	UT 6	0.34	12.0			330	383	032	94	36	08	403		055	060	2.64		0.16			00.7		691	
33072	UT 6	0.81	15.5			317	372	031	86	37	08	387		028	071	2.64		0.07			01.1		653	
40572	UT 6	1.40	12.5				219	021	32	34	07			025		1.98		0.11			00.6			
41372	UT 6	0.90	08.5		605	318	358	029	81	38	06	388		031	070	2.24		0.11			01.4		645	
41972	UT 6	1.00	06.5			313	368	030	85	38	06	382		027		2.20					00.9		0600	
50372	UT 6	1.13	13.0																					
51072	UT 6	2.57	14.0		810	331	299	036	82	23	09	404		027		2.76		0.21			01.6		663	
31672	UT 7	0.62	14.0			327	362	046	71	45	08	400		020	094	0.90		0.08			06.6		668	
32372	UT 7	0.59	12.0			228	376	047	75	46	12	279		007	087	0.83		0.23			01.6		554	
33072	UT 7	0.54	15.0			276	294	035	57	37	06	337		021	070	0.78		0.10			00.7		564	
40572	UT 7	0.64	14.0		497		194	029	22	34	04			022		1.14		0.07			00.3		401	
41372	UT 7	0.62	07.0		551	227	237	031	44	31	04	273		018	075	1.26		0.09			01.7		0482	
41972	UT 7	0.62	06.0			259	273	031	60	30	04	316		018		1.23		0.02			00.6		0567	
50372	UT 7	2.74	13.5																					
51072	UT 7	3.55	14.0		616	309	332	038	64	42	05	378		015		0.78		0.08			02.3		643	
31672	UT 8	2.40	13.0			298	364	059	80	40	08	364		031	170	2.80		0.52			02.0		755	
32372	UT 8	2.70	12.0			292	351	046	78	36	09	357		026	071	2.66		1.36			05.6		656	
33072	UT 8	2.70	13.5			322	294	035	57	37	06	393		036	040	3.36		1.02			06.3		608	
40572	UT 8	3.15	12.5		691		312	035	61	39	06			033		2.84		0.39			03.7		0755	
41372	UT 8	5.14	08.0		648	260	254	037	44	35	08	318		034	063	3.05		1.22			03.9		0588	
41972	UT 8	5.14	08.5			301	343	035	78	36	08	368		030		2.76		0.84			02.6		609	
42672	UT 8	4.70	13.5		713	309	360	038	80	39	10	378		032	051	1.95		1.10			06.7		631	
50372	UT 8	5.70	13.5		853	334	342	042	73	39	12	371		035	080	5.85		0.75			06.1		657	
51072	UT 8	6.30	15.0		724	295	381	044	72	49	10	361		192		2.65		2.03			04.3		782	
82669	UT 9		25.5	8.80																		13.0		035
90269	UT 9		22.8	8.80																		09.4		029

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
90969	UT 9		20.8	8.40																		05.5		020
50570	UT 9			8.15	655	258	338	23	73	38	4	311	2.4	28	103	1.81				4300	4.8			
60270	UT 9			8.00	675	243	342	22	73	39	5	294	1.6	30	106	0.16				2000	5.0			
61670	UT 9	34.2					298	16	70	30	5			14										
63070	UT 9	24.8		8.20	600	254	309	17	68	34	3	290	9.9	22	73	1.13		0.40		930	5.3			
70470	UT 9	20.6 *				213	342	24	76	37	6	246	7.0	16	90	0.99		0.30						
71470	UT 9	19.5 *				129	367	55	86	37	4	158		18	77	0.99		0.10						
71770	UT 9	16.9	26.0	8.20			222									1.40		0.02					464	12
73170	UT 9	27.0																					358	
80470	UT 9	16.0 *																			5.5			
81170	UT 9	7.0 *				197	263	22	56	30	6	241		17	93	1.24		0.40						
81470	UT 9	7.4 *	23.0	8.50										38		1.20		0.14				8.0		
82870	UT 9	19.0	21.0	8.10										38		1.20		0.03				9.0	472	22
90170	UT 9	10.1 *		8.25	650	265	369	21	77	43	3	317	3.1	33	95	1.18		0.70	0.35	9300	5.2			
92370	UT 9	21.6 *		7.90		156	321	19	71	35	3	191		16	69	2.64		0.50		3				
100570	UT 9	14.5																		2300	4.3			
101570	UT 9	22.7 *	9.5	8.15										25		1.10		0.04				10.0		10
102970	UT 9	28.8 *	7.0	8.25	700									25		1.90		0.03				12.0	423	5
110270	UT 9	28.5		8.15	630	261	340	18	77	36	4	314	2.4	29	82	1.81		0.20	0.31	9300	5.0			
111270	UT 9	28.8 *	7.0	8.10	690									25		1.60		0.04				9.0	422	15
111670	UT 9	28.0		8.20		213	345	24	79	36	4	260		15	84	2.12		0.10						
112670	UT 9	25.5 *	8.0	8.10	568									25		1.70		0.02				10.0	421	
113070	UT 9	25.8		8.20	670	277	359	20	78	40	4	333	2.9	30	93	1.60		0.20		7200	5.8			
121070	UT 9		6.0	8.20	690									25		1.50		0.05				8.0		5
122270	UT 9		2.0	8.10	649									25		0.32		0.17				9.0	453	5
10471	UT 9	22.0		8.20	635	268	342	20	75	38	4	321	2.8	30	90	2.10		.10	0.32	1500	5.9		450	20
11471	UT 9		3.0	8.65	629									37		1.40		0.12				9.0	442	
20271	UT 9		7.0	8.85	649											1.60		0.11				8.0	436	
20871	UT 9	21.3		8.25	675	254	330	22	68	39	4	304	3.0	34	100	2.70		0.20		5000	6.0			
21171	UT 9		7.0	8.40												1.60		0.11				7.0	450	
21871	UT 9	21.6 *	6.0	8.12	610	214						262	.			1.64	0.04	0.21				9.0	400	
30271	UT 9			8.00	640	233	309	22	58	40	4	282	1.6	30	90	1.60		0.10		150	7.3		390	
30471	UT 9			8.30	650											1.86	0.10							
31171	UT 9			8.10	570											1.74	0.06	0.08					457	
31871	UT 9			8.12	590											1.76	.	0.11					496	
32571	UT 9			8.10	590											1.74	.	.10					424	
40171	UT 9	18.3		8.10	570											2.54	0.04	0.09					429	
40671	UT 9	16.6 *		8.20	680	250	319	22	67	37	4	300	2.6	17	95	1.63		0.10		430	5.8			
41571	UT 9	16.5 *		7.85	510											1.03		0.03					424	
42771	UT 9	18.0 *		8.20	530	206	311	25	62	38	7	252	.	17	114	1.42	0.07	0.16					448	
51371	UT 9	17.0 *		8.30	550	209						251	2.3			1.49		0.13						
52071	UT 9	14.0 *		8.40	550									17		1.46		0.12						
60871	UT 9	22.5 *		8.02	530											1.23		0.10						
61571	UT 9	32.5 *		8.20	510													0.24						
62271	UT 9	21.0 *		8.30	540													0.22						
62971	UT 9	17.3 *		8.10	590													0.10						
71371	UT 9			8.10	540													0.21						
72071	UT 9			8.20	580													0.78						
72971	UT 9			8.10	590													1.25						
31672	UT 9	18.6	12.0			278	357	040	82	37	03	340		013	091	2.20		0.33			02.0			

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
32372	UT 9	19.5	11.0			244	353	031	82	36	04	298		013	084			0.05			03.2		0255	
33072	UT 9	20.1	09.0			292	347	026	78	37	03	357		016	086	1.88		0.04			01.1		0233	
40572	UT 9	16.0	13.0		497		208	023	24	36	03			008		1.65		0.07			00.8		0582	
41372	UT 9	16.2	08.5		551	236	279	025	54	35	03	288		017	088	1.50		0.06			01.2		0475	
41972	UT 9	15.1	08.5			292	336	024	77	35	03	357		015		1.63		0.01			00.7		0501	
42672	UT 9	12.8	12.0		616	318	340	023	77	36	04	389		017	034	1.15		0.03			01.0			
51072	UT 9	05.0	14.2		533	304	338	029	73	38	03	371		011		1.20		0.07			01.3		0344	
31672	UT10	3.53	16.0			251	375	031	101	30	04	307		015	178	2.40		0.02			00.6		668	
32372	UT10	3.71	13.0			212	421	018	121	29	05	259		013	087	1.86		0.03			01.8		0540	
33072	UT10	4.22	14.5			228	321	012	84	27	05	279		012	071	1.86		0.03			00.2		492	
40572	UT10	4.33	14.0		432		210	008	38	29	04			012		1.90		0.06			00.3		0440	
41372	UT10	4.75	08.8		562	291	353	013	97	27	04	356		019	074	2.18		0.07			00.5		0571	
41972	UT10	4.80	10.0			267	326	012	88	26	04	326		012		1.84		0.01			00.6		0450	
50372	UT10	4.66	15.5																					
51072	UT10	5.68	16.0		562	289	311	020	77	29	04	353		010		2.56		0.05					566	
31672	UT12	0.60	15.0			190	329	031	89	26	04	232		013	078	1.65		0.03			01.5		0475	
32372	UT12	0.77	12.0			190	393	017	113	27	05	232		014	181	1.66		0.04			00.1		591	
33072	UT12	0.85	15.5			139	331	014	80	27	04	170		014	085	0.74		0.07			00.3		403	
40572	UT12	0.99	13.5		432		211	013	42	26	04			015		1.60		0.08			00.2			
41372	UT12	1.27	09.0		475	262	346	016	96	26	04	320		016	087	1.92		0.04			00.9		567	
41972	UT12	1.68	09.5			272	353	014	97	27	04	333		014		1.58					00.4		0599	
51072	UT12	2.85	15.0																					
31672	UT13	01.0	15.0			231	338	054	86	30	05	282		017	110	1.27		0.02			01.7		585	
32372	UT13	01.1	12.0			185	329	021	89	26	07	226		016	074	1.10		0.04			01.5			
33072	UT13	01.0	14.0			219	527	022	81	79	05	268		015	101	0.94		0.03			00.9		572	
40572	UT13	01.0	13.2		513		220	020	42	28	04			012		0.32		0.05			00.4		0533	
41372	UT13	01.8	04.5		378	196	217	010	64	14	03	240		010	044	0.30		0.07			01.4		385	
41972	UT13	01.1	08.0			237	204	015	44	23	04	290		012		1.05		0.03			00.4		0421	
50372	UT13	01.1	17.0																					
51072	UT13	01.1	19.0		497	240	291	029	72	27	04	293		010		1.42		0.10			02.3		437	
31672	UT14	1.39	16.0			222	342	037	91	28	03	271		013	104	1.85		0.02			01.5		549	
32372	UT14	1.39	12.0			232	396	016	114	27	04	284		015	085	1.36		0.04			01.4		548	
40572	UT14	1.93	14.3		454		236	011	40	26	02			013		1.56		0.06			00.8		0485	
41372	UT14	1.98	09.0		464	245	327	010	90	25	03	299		013	089	1.64		0.04			01.0		385	
41972	UT14	2.23	10.0			253	313	013	66	24	03	309		011		1.44		0.02			00.9		0231	
50372	UT14	2.63	15.0																					
51072	UT14	3.01	15.5																					
31672	UT15	1.93	16.0			222	332	031	95	23	03	272		011	059	2.80		0.04			02.6		507	
32372	UT15	2.00	13.0			185	363	012	106	24	03	226		010	062	2.50		0.08			01.3		446	
40572	UT15	2.08	[illegible]		432		211	010	45	24	02			012		2.55		0.06			00.1		0405	
41372	UT15	2.23	09.2		389	117	165	010	30	22	03	143		010	067	2.58		0.13			00.9		0418	
41972	UT15	3.58	10.0			250	298	012	83	22	03	305		009		2.44		0.02			00.9		0419	
50372	UT15	2.23	15.5																					
51072	UT15	2.96	16.5		497	258						315		004		3.06		0.08			01.0		0377	
31672	UT16	1.07	16.0			225	584	042	150	51	05	275		022	214	2.15		0.01			01.4		761	
32372	UT16	1.11	13.0			218	404	026	104	35	04	267		028	143	1.94		0.17			02.4		609	
33072	UT16	1.19	14.5			135	389	025	98	35	03	165		024	158	1.84		0.04			00.4		510	
40572	UT16	1.15	13.8		572		279	021	56	34	03			020		0.40		0.06			00.1		0644	
41372	UT16	1.23	09.0		583	422	415	022	112	33	03	516		021	138	2.06		0.04			01.6			
41972	UT16	1.27	10.0			242	349	022	92	29	03	296		019		2.16		0.03			00.8		563	

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
51072	UT16	0.77	17.5		583	245	350	025	81	36	02	300		022		2.15		0.09			00.4		568	
31672	UT17	1.97	15.0			276	410	027	105	36	05	337		018	122	2.90		0.08			01.2		653	
32372	UT17	1.90	12.0			141	349	034	74	40	08	173		030	159	3.54		0.04			00.6		0522	
40572	UT17	2.00	17.5																					
41372	UT17	2.25	08.5		626	285	393	018	103	33	04	348		017	109	2.55		0.08			01.9		0635	
41972	UT17	3.12	08.0			300	356	017	95	27	04	366		013		2.35		0.06			01.4		0511	
51072	UT17	3.50	16.0		562	316	347	018	83	34	04	386		013		3.25		0.07			00.6		541	
82669	UT18		27.3	8.70																		10.2		087
90269	UT18		24.0	8.70																		12.4		029
90969	UT18		23.4	8.50																		08.7		041
50570	UT18			8.15	700	258	384	35	88	40	6	311	2.4	41	116	2.24		1.00		4300	8.9			
60270	UT18			8.10	710	268	367	27	83	39	5	323	2.2	35	106	0.20		0.60		3000	10.0			
61670	UT18						366	26	69	35	7			24										
63070	UT18	26.1		8.00	745	281	370	30	84	39	5	340	1.9	36	104	2.24		2.00		9300	9.0			
70470	UT18	25.0 *				241	426	37	98	44	8	295		33	140	2.24		2.80						
71470	UT18	23.6 *				319	432	77	99	45	7	390		32	103	2.24		1.00						
71770	UT18	23.8	24.0	8.10	450		256									1.05		0.55				8.0	622	52
73170	UT18	28.5	22.3	8.35			394									0.38		0.13				7.0	503	45
80470	UT18	26.1 *																			8.4			
81170	UT18	25.2 *				272	372	32	88	37	9	277	2.7	30	110	2.24		1.40						
81470	UT18		22.0	8.15										63		1.10		0.64				8.0		23
82870	UT18	31.5	18.5	8.10										50		1.60		0.46				7.0	528	60
90170	UT18	37.1 *		7.35	775	299	401	40	93	41	5	362	1.4	40	104	2.24		0.70	0.40	3000	5.5			
92370	UT18	40.4 *		8.30		233	387	26	91	39	5	275	5.0	20	73	3.68		0.80						
100570	UT18	40.6																		3000	5.0			
101570	UT18		9.5	8.15										50		0.15		1.30				9.0		20
102970	UT18		9.0	8.15	792									37		1.60		0.13				7.0	498	23
110270	UT18	35.5		8.10	725	300	382	26	89	39	5	362	2.5	30	95	0.41		0.50	0.36	3000	9.5			
111270	UT18		9.0	8.00	864									50		1.70		0.13				7.0	507	65
111670	UT18	35.9		8.20		247	379	30	86	40	6	302		25	96	1.65		0.20						
112670	UT18		9.0	7.80	771									63		0.03		0.07				8.0	609	90
113070	UT18	32.8		8.20	835	323	411	35	92	44	6	388	3.4	42	117	0.50		0.80		9300	6.7			
121070	UT18		6.5	8.05	824									37		1.60		0.22				8.0		28
122270	UT18		2.0	8.50	924									50		0.57		0.25				9.0	513	
10471	UT18	26.0		8.10	760	311	404	30	91	43	5	374	2.6	38	102	2.62		0.50	0.36	3000	8.8		554	53
11471	UT18		6.0	8.50	924									63		1.60		0.35				8.0	573	
20271	UT18		7.0	8.80	864											1.60		0.41				6.0	568	
20871	UT18	31.2		7.65	595	248	300	15	84	22	5	302	0.7	34	61	1.20		0.10		2100	6.7			
21171	UT18		7.0	8.40												1.90		0.31				7.0	582	
21871	UT18	30.0	6.0	7.75	865	263						321				2.62	0.04	1.10				7.0	639	
30271	UT18	27.6		7.95	880	303	438	32	93	50	5	367	1.8	50	129	2.21		0.60		4300	9.0		731	
30471	UT18	27.6		8.12	815											2.22	0.02	1.00						
31171	UT18	29.9 *		8.15	690											2.62	0.05	0.54					568	
31871	UT18	30.9		7.78	720											2.75		0.60					602	
32571	UT18	29.1 *		8.10	730											2.52		0.92					529	
40171	UT18	27.7 *		8.31	710											1.78	0.20	0.90					532	
40671	UT18	27.5 *		8.20	820	309	388	30	88	41	5	371	3.3	27	104	5.42		0.40		1500	8.0		675	
41571	UT18	28.5 *		8.10	660											2.40		0.74					551	
42771	UT18			8.15	650	254	377	47	87	39	9	311		35	126	2.00	0.14	0.66					657	
51371	UT18	35.0 *		8.20	530	204						246	1.8			1.54		0.36						

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  DATE  STA  FLOW    TEMP   PH COND  AL HARD  NA  CA  MG  K HCO3 CO3   CL  SO4  NO3 NH3   PO4    F  COLF  BOD    DO  DS TURB

 52071 UT18  32.0 *       8.30  630                                    26      1.98      0.62
 60871 UT18  32.0 *       7.87  600                                            1.40      0.46
 61571 UT18  28.8 *       8.10  550                                                      0.41
 62271 UT18  15.0 *       8.15  690                                                      0.72
 62971 UT18  20.0 *       8.02  770                                                      0.57
 71371 UT18               8.00  740                                                      0.96
 72071 UT18               8.00  710                                                      0.92
 72471 UT18               8.15  710                                                      2.08
 31672 UT18  20.3    13.0                423 037 102  41 04           019  106 3.05      0.42            02.7
 32372 UT18  19.3    11.0           122  436 037 107  41 06  149      033  100 4.10      0.47            03.5
 33072 UT18  19.8    14.0           351  417 035  98  42 06  429      028  111 3.34       .48            03.0      0752
 40572 UT18  23.7    12.5       637      290 044  47  42 05           040      2.25      0.18            01.0      0642
 41372 UT18  22.4    08.0           337  432 033 100  37 04  412      029  131 2.86      0.39
 41972 UT18  31.8    07.5           318  393 042  95  38 06  389      031      2.44      0.51            06.5      0604
 42672 UT18  23.7    12.5       708 318  394 038  92  40 05  389      027  097 2.25      0.37            02.2       671
 50372 UT18  20.8    13.0       799 287  388 036  88  41 06  351      025  119 2.15      0.32            03.9       668
 51672 UT18  16.8    17.0       734 326  397 042  90  42 05  398      034      1.75      0.28            03.7       613
 41972 UT21          06.0           586  374 130  51  60 25  715      105      0.75      0.29            02.6
 51072 UT24  00.2    17.2       508 272  397 025  90  42 04  332      015      0.72      0.06            00.3       507
 31672 UT25  01.3    16.0           326  415 042  84  50 17  398      030  076 1.20      0.17            02.2      0666
 32372 UT25  01.0    13.0           162  376 042  80  43 16  198      027  065 0.97      0.18            02.5      0483
 33072 UT25  01.0    16.0           366  322 037  73  34 18  447      025  079 0.72      0.19            01.0       714
 40572 UT25  1.00    14.8       637      134 013  29  15 02           026      0.78      0.68            01.2      0688
 41372 UT25  01.0    08.0       648 381  374 039  79  43 15  465      029  076 0.80      0.18            02.4       747
 41972 UT25  01.5    06.5           395  361 051  72  44 18  482      032      0.52      0.14            02.9       700
 51072 UT25  01.3    19.5       767 426  397 030  65  57 19  520      025      1.13      0.13            01.7       717
 50372 UT25  01.5    18.5
 82669 UT29   28.    24.8 8.50                                                                                 06.2      030
 90269 UT29   30.    23.5 8.60                                                                                 07.8      028
 90969 UT29   37.    22.6 8.50                                                                                 07.5      025
 50570 UT29   84.         8.15  460 182  232  12  65  17  3  219 1.7   20   56 0.23                  200 10.0
 60270 UT29  118.         8.00  460 174  238  12  64  19  2  211 1.2   25   54 0.36      0.10        930  6.9
 61670 UT29  376.                        181   9  56  10  4             9
 63070 UT29  117.         8.10  365 143  180   8  49  14  3  173 1.2   20   37 0.20      0.10        230  6.6
 70470 UT29   25.                   131  196  13  59  12  4  161       11  100           0.30
 71470 UT29   25.                   148  232  51  65  17  4  181       13   42 0.41      0.80
 71770 UT29   11.    27.0 8.40  240      154                                   0.22      0.14                  13.0 283   10
 73170 UT29    8.    25.5 8.30           256                                   0.31      0.03                  11.0 264   10
 80470 UT29   13.                                                                                         6.5
 81470 UT29    7.         8.20                                         36      0.09      0.17                  10.0
 81170 UT29    8.                   136  176  14  46  15  6  166       14   45 0.00      0.80
 82870 UT29   19.    24.5 7.90                                   0     36      0.49      0.04                   6.0 325
 90170 UT29   17.         8.25  415 183  226  11  61  18  3  219 2.2   23   39 0.14      0.10 0.23   930  7.5
 92370 UT29   93.         8.20      151  253  19  70  19  7  165       14   47           0.20
100570 UT29   34.                                                                                   4300  7.5
101570 UT29  113.     8.0 7.95                                         25      1.40      0.09                   6.0        5
102970 UT29  336.     7.5 8.11  447                                    25      0.11      0.03                   6.0 263   10
110270 UT29  331.         8.40  400 161  203  11  55  16  4  192 2.7   24   50 0.20      0.10 0.22   930  7.5
111270 UT29  329.     7.5 8.10  487                                    25      0.14      0.03                   9.0 253    9
111670 UT29  319.         8.10       57  197  12  56  14  4   70        8   56 0.21
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112670	UT29	411.	7.0	8.00	264									25		0.21		0.03				9.0	259	40
113070	UT29	401.		8.20	410	161	201	11	56	15	3	194	1.7	20	52	0.18		0.20		430	8.5			
121070	UT29	379.	4.5	8.15	437											0.21		0.04				8.0		16
121470	UT29	374.		8.30		133	234	54	69	15	3	163		8	54	0.30		0.30						
122370	UT29	380.	4.0	8.20	305									25		0.09		0.06				10.0	271	
10471	UT29	377.		8.30	410	165	228	11	58	20	4	197	2.2	19	53	0.25		0.10	0.22	230	6.6		274	15
11471	UT29	260.	2.0	8.45	426									25		0.22		0.16				9.0	365	
11671	UT29	261.		8.53	365	148	240	12	75	13		181		10		0.33	0.04	0.00					346	
20271	UT29	306.	4.0	8.90	426											0.37		0.08				9.0	270	
20871	UT29	328.		8.10	450	163	219	11	58	18	3	196	1.7	24	58	0.17		0.10		430	6.3			
21171	UT29	392.	4.0	8.75												0.36		0.33				10.0	295	
21871	UT29	281.	4.0	7.84	430	143						175				0.44	0.02	0.25				7.0	260	
30271	UT29	180.		8.40	455	171	224	11	60	18	4	204	2.8	30	61	0.54		0.10		150	3.4		391	
31171	UT29	165.		8.25	420											0.41	0.06	0.08					285	
31971	UT29	157.		8.05	460											0.39		0.11					350	
32571	UT29	264.		8.10	440											0.44		0.18					297	
40171	UT29	350.		8.08	420											0.65	0.08	0.09					297	
40671	UT29	325.		8.20	455	165	221	11	59	18	3	199	1.7	11	54	0.60				4300	6.0		357	
42771	UT29	362.		8.20	340	140	219	12	63	15	5	172		11	55	0.30	0.04	0.24					334	
51371	UT29	191.		8.20	370	133						160	1.1			0.26		0.09						
52071	UT29	162.		8.30	400									11		0.28		0.08						
60871	UT29	165.		7.05	330											0.31		0.14						
61571	UT29	456.		8.20	295													0.28						
62271	UT29	369.		8.30	295													0.19						
62971	UT29	120.		7.63	330													0.10						
71371	UT29	13.		7.90	430													0.31						
72071	UT29	16.		7.90	400													0.52						
72971	UT29	12.5 *		8.20	420													1.23						
31672	UT29	354.	09.0			46	250	016	77	14	03	57		009	054	0.28		0.06			02.0		0443	
32372	UT29	364.	07.0				236	014	70	15	03			010	050	0.36		0.04			01.2			
33072	UT29	332.	08.0			186	219	012	63	15	03	227		009	049	0.14		0.03			01.5		378	
40572	UT29	266.	07.5		378		134	013	29	15	02			016		0.18		0.06			00.3		0349	
41372	UT29	341.	06.0		421	169	215	010	63	14	03	207		009	045	0.22		0.04			01.6		0389	
41972	UT29	313.	07.0			181	210	010	63	13	03	221		038		0.17		0.02			00.7		348	
42672	UT29	274.	08.0		410	162	201	013	56	15	03	193		005	045	0.06		0.00			00.1		0429	
50372	UT29	172.	08.3		475	160	210	013	61	14	03	205		005	047	0.11		0.05			01.9			
51072	UT29	121.	12.0		356	164	234	015	46	29	02	201		005		0.15		0.08			00.0			
31672	UT31	01.5	15.0			281	318	020	93	21	04	343		014	061	0.25		0.06			01.8		556	
32372	UT31	00.5	12.0			203	318	016	93	21	05	248		016	057	0.22		0.13			01.9		456	
33072	UT31	01.3	11.0			266	303	021	87	21	04	325		016	052	0.15		0.11			01.4		526	
40572	UT31	01.8	14.0		378		178	016	37	21	03			017		0.15		0.08			00.5		0550	
41372	UT31	02.1	07.0		482	202	309	016	91	20	04	345		019	062	0.25		0.10			01.1		0557	
41972	UT31	01.0	04.0			269	294	017	85	20	05	329		015		0.35		0.04			01.4		0460	
51072	UT31	00.5	19.1		572	283	287	016	77	23	04	346		012		0.22		0.09			02.6		0480	
32372	UT32	00.7																						
33072	UT32	00.7																						
41372	UT32	00.7	11.5			309	359	020	106	23	04	377		020	112	1.15		0.04			00.4		663	
41972	UT32	00.7	12.0			350	352	019	103	23	05	427		016		1.08		0.02			01.0		494	
51072	UT32	00.7	12.0		583	314	343	031	98	24	04	384		016		0.88		0.05			00.2		0558	
32372	UM33	00.1																						

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33072	UT33	00.1																						
40572	UT33	00.1	12.2																					
41372	UT33	00.1	12.0		486	273	227	034	58	20	04	334		027	016	0.14		0.15			03.1		493	
41972	UT33	00.1	12.0			163	222	033	56	20	04	199		023		0.06		0.14			01.0		335	
51072	UT33	00.1	12.0		454	265	223	036	55	21	04	324		018		0.02		0.10			01.9		0458	
32669	UT34		24.7	8.40																		04.8		023
90269	UT34		22.8	8.50																		08.4		024
90969	UT34		22.3	8.40																		07.3		026
50570	UT34			7.70	575	231	280	14	84	19	4	281	0.7	28	55	1.24		0.10		930	2.5			
60270	UT34			7.95	570	240	303	13	87	21	4	290	1.4	28	49	1.29		0.10		230	2.9			
61570	UT34	15.0 *					314	15	93	20	6			20										
63070	UT34	11.8 *		8.00	610	241	305	14	86	22	5	291	1.6	31	61	2.24		0.20		390	2.3			
70470	UT34	11.9 *				198	314	16	93	20	6	242		18	80	2.24		0.40						
71470	UT34	11.6 *				200	347	52	98	25	6	244		20	56	2.24		0.10						
71770	UT34	10.0	16.5	7.85			205									1.20		0.38				6.0	418	5
73170	UT34	11.5	19.0	7.90			308									2.01		0.38				7.0	328	
80470	UT34	11.7 *																			2.3			
81170	UT34	11.6				152	203	15	50	19	7	186		17	58	1.56								
81470	UT34		17.0	7.45										37		1.64		0.15				5.0		
82870	UT34	11.6	17.5	7.60										37		1.32		0.07				5.0	443	
90170	UT34	12.0 *		8.20	595	243	302	18	83	23	5	292	2.6	30	54	1.36		0.20	0.25	2300	3.0			
92370	UT34	11.9 *		8.00		127	285	18	83	19	5	155	0.7	14	50	0.20		0.10						
100570	UT34	11.5 *																		2900	3.8			
101570	UT34	10.7	11.0	7.45										25		0.55		0.08				6.0	398	
102970	UT34	10.5 *	10.0	7.65	660									37		1.20		0.11				6.0	385	
110270	UT34	10.3 *		7.75	600	259	315	16	85	25	7	314	1.0	30	52	0.95		0.20	0.25	4300	3.4			
111270	UT34	10.1	10.5	7.60	690									37		0.65		0.04				5.0	391	10
111670	UT34	9.6 *		7.80		223	305	19	86	22	7	273	0.8	18	57	1.13								
112670	UT34	10.1	10.0	7.70	447									37		0.66		0.07				7.0	389	20
113070	UT34	10.1 *		7.75	630	249	314	2	88	23	6	302	0.9	33	78	1.02		0.60		930	3.0			
121070	UT34	6.0	7.0	7.70	824									25		0.85		0.11				8.0		3
121470	UT34	5.5 *		8.30		173		58		20		212	1.9	17	59	1.10		0.10						
122370	UT34	5.7 *	7.0	7.70	588									38		0.45		0.13				9.0	378	
10471	UT34	6.1 *		7.70	615	260	304	15	86	22	04	316	0.9	30	50	1.04		0.10	0.23	4300	2.5		525	13
11471	UT34	5.7 *	6.0	8.10	629									38		0.85		0.12				7.0	388	
11671	UT34	5.6 *		8.15	500	188	346	15	104	21		230	1.5	1		0.97	0.18						372	
20271	UT34	4.0 *	8.0	8.40	588											0.85		0.14				5.0	398	
20871	UT34	5.7 *																		930	3.9			
21171	UT34	5.9 *																					450	
30271	UT34	4.3 *		8.30	600	236	288	15	81	21	5	282	3.1	39	55	1.24		0.20		230	2.3		502	
31171	UT34	4.7 *		7.92	530											1.10	0.06	0.12					393	
31871	UT34	4.7 *		7.75	530											1.16		0.11					423	
32571	UT34	5.1 *		7.80	550											0.92		0.14					393	
40171	UT34	5.8 *		7.70	540											1.04	0.08	0.08					383	
40671	UT34	5.8 *		7.80	650	246	302	15	83	23	5	299	1.0	21	57	1.13				430	2.8		368	
42771	UT34	5.8 *		7.70	450	212	272	17	76	20	7	259	0.6	21	61	2.22	0.06	0.04					398	
51371	UT34	6.6 *		7.70	500	181						220	0.5			1.87		0.14						
52071	UT34	6.5 *		8.30	530									21		2.19		0.17						
60871	UT34	11.9 *		7.68	540											2.07		0.10						
61571	UT34	12.3		8.00	520													0.26						

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62271	UT34	12.3		8.10	530													0.21						
62971	UT34	12.9		7.70	540													0.14						
71371	UT34	11.3		7.85	530													0.27						
72071	UT34	11.9		7.80	550													0.60						
72971	UT34	7.9 *		7.85	570													1.37						
31672	UT34	04.8	16.0			263	289	024	83	20	05	322		027	051	0.65		0.04			02.9		0532	
32372	UT34	04.8	13.0			290	306	018	88	21	06	354		021	050	0.60		0.04			00.1		0512	
33072	UT34	04.9	16.0			250	293	023	83	21	05	306		019	046	0.73		0.08			00.5		503	
40572	UT34	05.0	15.2				233	014	47	21	04			017		0.65		0.08			00.3			
41372	UT34	06.2	08.0		518	250	257	019	70	20	04	305		020	057	0.96		0.05			01.2		0549	
41972	UT34	05.2	09.0			287	307	018	90	20	04	351		016		1.26		0.04			01.1		500	
42672	UT34	05.2	14.0		605	259	292	020	84	20	04	317		019	051	1.43					01.5		516	
50372	UT34	05.1	15.0			255	307	018	90	20	05	312		013	056	1.55		0.03			01.8			
51072	UT34	04.9	17.0		497	266		017				328		015		1.49		0.05			01.0		0360	
31672	UT35	01.0	16.0			218	263	015	79	16	03	266		009	045	0.65		0.03			00.5		434	
32372	UT35	02.0	15.0			150	249	015	72	17	04	184		012	046	0.77		0.13			01.9		351	
40572	UT35	01.3	15.5		292		133	011	27	16	02			013				0.07			00.3		0253	
41972	UT35	00.0	05.0		0																			
51072	UT35	03.5	18.0		421	191	210	014	58	16	02	234		09		0.41		0.07			00.9		414	
32372	UT36	00.4	15.0			190						232		018		0.44		0.08			02.2		0273	
33072	UT36	00.4	17.0				282	025	67	20	04				331									
40572	UT36	00.6	16.5		410		141	010	14	26	03			015		0.16		0.03			00.7		0431	
41972	UT36	02.5	10.5			169	184	015	54	12	03	207		010		0.72		0.05			01.3		302	
50372	UT36	00.7	16.0																					
51072	UT36	00.4	19.5																					
32372	UT37	00.6	12.0			194	365	020	105	25	05	237		018	054						01.2		464	
33072	UT37	00.6	13.0			323	362	024	104	25	04	395		070	057	1.44		0.07			01.0		661	
40572	UT37	00.7	11.7		475		219	010	45	26	04			018		1.06		0.07			00.2		0789	
41372	UT37	01.2	10.5		518	331	366	017	107	24	04	405		019	058	1.40		0.08					635	
41972	UT37	01.0	11.0			340	362	021	104	25	04	415		019		1.42		0.05			00.1		589	
31672	UT38	16.2	13.0			231	264	028	78	17	03	283		013	049			0.13			01.6		471	
32372	UT38	16.2	13.0			246	252	018	73	17	05	301		014	046	0.76		0.78			01.6		476	
33072	UT38	15.7	12.0			219	259	016	74	18	03	268		012	045	0.85		0.11			01.2		437	
40572	UT38	15.1	12.2		346		146	014	29	18	03			021		0.93		0.08			00.2			
41372	UT38	10.2	11.8		432	236	249	013	72	17	03	289		014	043	0.98		0.07			01.2		0404	
41972	UT38	15.6	08.8			154	167	019	49	11	03	188		020		0.83		0.07			02.4		0313	
42672	UT38	12.0	12.0		464	204	241	017	67	18	03	249		009	036	0.88		0.08			01.1		0400	
50372	UT38	10.2	14.5		540	207	259	015	74	18	03	253		011	045	0.93		0.15			02.4		420	
51072	UT38	11.7	15.5		497	204	234	016	64	18	03	250		012		0.89		0.08			01.3		364	
31672	UT41	04.0	10.0			137	319	031	80	29	03	168		015	044	0.85		0.03			04.4		371	
32372	UT41	04.3	11.0			178	307	027	77	28	04	218		023	042	1.00		0.05			02.3			
33072	UT41	04.0	14.0																					
40572	UT41	04.0	13.5													0.51								
41372	UT41	00.2	12.0																					
41972	UT41	05.8	07.0			233	237	021	62	20	04	285		016		0.71		0.05			02.3		409	
51072	UT41	04.5	17.0		562	259	299	021	77	26	04	317		016		0.69		0.09			01.9		464	
81470	UT42		20.0	7.35										63		0.85		1.12				6.0		10
82870	UT42		19.5	7.35										63		0.36		0.25				5.0	1065	5
90370	UT42		17.0	7.35																				
121470	UT42						264	78	17	54	6		10.0		338			0.40						

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
10471	UT42																				12.0			
10571	UT42			7.80	970	234	420	40	99	42	5	284	1.0	54	268	0.82		0.50	0.69	2300			740	10
11871	UT42			8.20	835	207	521	36	136	44		253	1.8	47		0.75	0.94	1.0					869	
20271	UT42		11.0	8.30	864											0.62		0.84				6.0	694	
21671	UT42		14.0	7.45	855	179						219	0.2			0.68	1.88	1.35				6.0	634	
30471	UT42			7.46	885											0.75	1.15	2.10						
31171	UT42			7.40	790											0.61	2.09	1.69					668	
31871	UT42			7.35	780											0.75	1.45	1.87					669	
32571	UT42			7.50	790											0.62	0.81	2.10					590	
40171	UT42			7.58	740											0.80	0.09	0.86					597	
40671	UT42			7.50	730											0.67		2.01					806	
42271	UT42			7.60	800											0.61	0.85	1.12					639	
42771	UT42			7.50	740	187	448	44	117	38	10	229	0.3	39	244	0.79	0.39	1.04					722	
50871	UT42			7.52	760											0.72	1.82	2.05						
51371	UT42			7.55	750	190						232	0.3			0.55	0.16	1.20						
52071	UT42			8.20	780									38		0.64	0.60	0.89						
61571	UT42			7.62	710													1.50						
62271	UT42			7.70	780													1.23						
62971	UT42			7.57	820													0.84						
71371	UT42			7.65	790													0.77						
72071	UT42			7.40	830													1.20						
72971	UT42			7.60	850													1.47						
80471	UT42			7.30	830													0.39						
31672	UT42	21.5	18.0																					
32372	UT42	21.5	16.0			235	486	051	132	38	07	287		044	293	0.54		0.07			02.3		853	
33072	UT42	22.7	17.0			153	239	060	70	40	06	187		037	282	0.63					02.3		683	
40572	UT42	21.5	17.0		767		345	033	74	39	05			040		0.51		0.08			01.0		0721	
41372	UT42	32.0	14.5		832	240	454	035	126	34	06	293		037	245	0.56		0.10			02.7		0917	
41972	UT42	31.5	11.5			251	449	043	122	35	05	307		033		0.65		0.05			01.4		0499	
47672	UT42	32.0	14.0		664	251	467	043	126	37	06	307		032	252	0.48					03.7		0977	
50372	UT42	32.0	18.0			251	526	043	148	38	06	307		022	278	0.64		0.08			03.1		843	
51072	UT42	33.0	18.0		907	269	495	040	129	42	06	329		036		0.57		0.08			02.6		582	
61670	UT43						364	24	98	29	7			21										
70470	UT43	19.6 *				200	387	41	99	34	6	245		44	130	1.31		5.20						
71470	UT43	8.1 *				202	391	74	99	35	9	247		53	124	1.40		4.30						
71770	UT43	9.2	20.0	7.70			205									0.30		1.45				6.0	543	20
73170	UT43	6.5	19.5	7.80												0.90		3.00				5.0	552	8
81170	UT43	6.5		0.		255	333	10	84	30	10	200	5.1	52	116	3.43		2.80						
82870	UT43	6.2	13.0	7.65										38		0.32		1.35				6.0	627	10
101570	UT43	5.0	8.0	7.70										50		1.40		2.25				5.0	532	40
102370	UT43	7.3 *		7.00					53						32									
102970	UT43	3.7 *	6.5	7.95	864									63		1.10		1.85				7.0	571	
111270	UT43	4.8	8.0	8.25	945									63		1.40		1.90				6.0	606	21
112670	UT43	5.5	8.0	7.70	508									75		0.06		1.30				7.0	640	130
121070	UT43	7.0	6.5	7.90	915									75		1.70		0.61				7.0		12
122370	UT43	7.1 *	6.5	7.85	944									65		0.57		1.10				8.0	654	
10571	UT43	9.3 *		8.20		226	468	35	110	47	6	276	2.0	37		1.94		3.4					582	
11471	UT43	11.8	4.0	6.15	944									75		1.40		3.10				8.0	640	
11671	UT43	11.8 *		8.50	805	235	472	39	110	48		287	4.2	56		1.46	1.32	3.2					745	
20271	UT43	11.4 *	8.0	8.80	812											1.20		1.90				6.0	600	

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
21671	UT43	11.8 *	13.0	7.95	810	197						241	1.0			1.36		2.25				8.0	570	
30471	UT43	12.7 *		7.88	825											1.21	0.84	2.68						
30871	UT43	13.6 *																					625	
31171	UT43	13.8 *		7.85	750											1.41	0.03	2.27					643	
31971	UT43	12.5 *		7.88	760											1.48	0.68	2.54					640	
32571	UT43	13.6 *		7.60	780											1.34	0.24	2.54					590	
40171	UT43	15.4 *		7.54	730											2.12	.	2.54					579	
42271	UT43	15.1 *		7.80	790											1.68	0.34	2.15					624	
42771	UT43	15.1 *		7.80	740	205	471	51	113	46	11	251	0.7	51	210	1.86	0.29	1.96					682	
50871	UT43	17.3 *		8.00	650											2.04	0.64	1.95						
51371	UT43	16.4 *		7.90	700	238						254	0.9			1.15	0.01	2.06						
52071	UT43	12.6 *		8.35	630											1.70	0.46	2.70						
61571	UT43	8.0		7.98	630													1.51						
62271	UT43	7.0		8.10	700													3.31						
62971	UT43	5.9		7.88	710													3.26						
71371	UT43			7.90	640													2.82						
72071	UT43	12.0		7.70	690													2.91						
72971	UT43	3.9 *		7.90	730													3.78						
80471	UT43	6.5 *		7.20	730													2.13						
31672	UT43	10.0	18.0			245	404	040	109	32	05	300		034	149	1.20		0.69			03.5		671	
32372	UT43	0008	13.0			208	378	037	102	30	05	254		011	122	1.73		0.93			00.4		564	
33072	UT43	08.8	16.0			245	220	018	67	13	02	299		036	037	2.05		0.91			03.4		475	
40572	UT43	08.2	16.0		616		271	034	61	29	05			045		2.10		0.85			01.1		0495	
41372	UT43	09.9	10.0		756	263	383	033	104	30	06	321		039	134	1.78		0.50			04.7		669	
41972	UT43	10.2	09.5			245	370	030	99	30	05	300		039		1.23		0.36			02.5		0511	
42672	UT43	08.8	13.0		767	240	385	040	100	33	08	293		044	131	1.88		0.96			02.7		0479	
50372	UT43		19.5		864	230	376	047	103	29	06	281		060	117	3.55		0.60			04.6		647	
51072	UT43		18.5		648	276	357	030	92	31	04	337		027		1.23		0.47			02.3		523	
82669	UT44		24.6	8.50																				021
90269	UT44		21.5	8.60																				023
90969	UT44		20.3	8.40														[illegible]		[illegible]	[illegible]	05.6		020
50570	UT44			8.10	320	136	166	7	50	10	2	164	1.1	19	26	0.45		0.10		1500	3.2			
60270	UT44			7.75	745	237	374	23	97	32	5	268	0.9	40	131	1.70		2.10		2300	2.5			
63070	UT44	.4 *		7.75	815	254	402	28	97	39	7	309	1.0	47	146	0.52		2.20		2300	3.0			
71770	UT44	2.6 *																					543	
73170	UT44	1.0																					552	
82870	UT44	1.6 *																					627	
90170	UT44	4.1 *		8.00	750	253	374	40	97	32	5	306	1.7	47	107	1.24		2.40	0.50	3000	3.6			
92370	UT44	5.5 *		8.10		104	206	17	53	18	2	128	0.7	14	32	1.11		0.10						
100570	UT44	9.2 *																		2300	3.2			
110270	UT44	27.5 *		8.25	490	204	244	12	65	20	4	244	2.4	22	41	0.66		0.10		2300	2.7			
111670	UT44	33.1 *		7.80		172	239	14	68	17	3	211	0.6	11	53	0.83								
113070	UT44	36.2 *		8.30	510	221	249	13	72	17	2	264	2.9	21	44	0.79		0.20		4300	2.5			
121470	UT44	32.9 *		8,20		129	235	24	68	16	2	158	1.1	31	28	0.82		0.50						
10471	UT44	31.3 *																			7.8			
10571	UT44	31.1 *		8.20	470	222	270	10	73	21	3	266	2.3	18	38	1.06		0.20	0.13	2300			433	15
11671	UT44	32.9 *		8.30	365	156	249	10	75	15		183	4.0	29		0.80	0.06	0.30					344	
20271	UT44	33.0 *	6.0	8.40	588																	7.0	281	
20871	UT44	33.0 *		8.25	480	206	242	11	69	17	2	247	2.4	29	43	0.66		0.10		4300	6.8			
21671	UT44	33.4 *	9.5	8.25	440	151						185	1.5			0.79	0.03					10.0	259	

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
30271	UT44	33.0 *		7.70	480	207	245	9	72	16	2	252	0.7	20	42	1.13		0.10		430	7.0		415	
30471	UT44	33.0 *		8.12	460											0.83	0.02							
31171	UT44	33.0 *		8.10	410											0.76	0.34	0.03					331	
31871	UT44	33.0 *		8.15	430											0.76		0.04					323	
32571	UT44	38.7 *		8.10	410											0.66		0.09					256	
40171	UT44	45.7 *		8.10	310											0.58	0.33	0.04					213	
40671	UT44	44.3 *		8.15	320	132	160	6	46	11	2	159	1.2	5	29	0.54		0.10		1500	7.5		260	
42271	UT44	44.3 *		8.20	265											0.48	0.02	0.08					221	
42771	UT44	44.7 *				204	182	9	58	9	3	250		4	25	0.45		0.20						
50871	UT44	39.7 *			255											0.38	0.04	0.15						
51371	UT44	35.6 *		8.25	285	125						151	1.2			0.40		0.16						
52071	UT44	37.8 *		8.50	320									6		0.53		0.17						
60871	UT44	13.0 *		8.10	430											0.46		0.17						
61571	UT44	14.0		8.40	430													0.25						
62271	UT44	3.0		8.10	470													0.18						
62971	UT44	5.0		8.27	450													0.14						
71371	UT44			7.80	690													0.50						
72071	UT44	3.8 *		8.10	610													0.51						
72971	UT44	2.9 *		7.80	610													1.42						
31672	UT44	40.5	09.0			159	184	010	59	9	01	195		005	031	0.70		0.04			02.9		0355	
32372	UT44	38.0	09.0			131	190	090	58	11	02	160		007	031	0.70		0.14			00.8			
33372	UT44	33.8	09.0			187	295	018	67	31	02	229		005	037	0.63		0.05			00.7		390	
40572	UT44	33.3	10.5																					
41372	UT44	38.2	08.0		605	169	183	007	57	10	02	207		004	012	0.48		0.05			01.5		300	
41972	UT44	37.5	05.0			168	181	008	56	10	01	206		005		0.38		0.03			00.8		286	
42672	UT44	34.2	07.2		356	167	185	010	56	11	02	204		004	030	0.46		0.06			01.0		318	
50372	UT44																							
51072	UT44																							
81969	UT45		24.3	8.70																				032
82669	UT45		23.4	8.50																				040
90269	UT45		23.5	8.80																				029
90969	UT45		20.7	8.30																		05.5		026
50570	UT45			8.20	1200	379	364	130	75	43	12	455	4.0	102	124	2.24		3.50		2300	8.0			
60270	UT45			7.75	770	329	389	36	90	40	40	400	1.2	97	83	2.24		0.20		2300	6.6			
61670	UT45	9.2 *					328	47	77	33	7			29										
63070	UT45	9.5 *		7.55	960	379	445	50	96	50	4	461	0.9	42	137	2.24		0.20		4300	8.5			
70470	UT45	5.7 *				251	351	43	83	35	7	307		26	104	2.24		0.40						
71470	UT45	8.2 *				231	334	46	81	32	6	283		26	70	1.47		0.40						
71770	UT45	10.0	18.5	7.60	430		256									0.75		0.03				6.0	508	150
73170	UT45	8.5	17.5	7.60			239									1.70		0.18				7.0	483	25
80470	UT45	8.7 *																			3.0			
81170	UT45	8.4				258	329	83	43	54	9	303	6.0	46	144	2.24		1.20						
81470	UT45	9.8	18.0	7.55										75		1.58		0.37				5.0		5
82070	UT45	9.5	13.0	7.50										75		1.64		0.39				5.0	552	10
90170	UT45	8.7 *		8.20	835	346	368	65	80	41	5	416	3.6	49	93	2.24		1.10	0.35	300	3.7			
92370	UT45	7.5 *		8.60		250	431	81	82	55	6	301	2.0	51	131	3.59		0.20						
100570	UT45	6.2 *																		930	4.0			
101570	UT45	9.8 *	9.0	7.70										75		1.50		0.26				9.0	649	35
102970	UT45	10.1 *	8.5	7.92	1186									100		2.10		0.09				6.0	735	8
110270	UT45	2.9 *		7.85	1170	408	441	95	91	52	5	494	1.9	70	152	2.15		0.30		7500	3.6			

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 DATE  STA  FLOW   TEMP PH   COND AL HARD  NA   CA  MG K HCO3 CO3    CL SO4  NO3  NH3  PO4    F   COLF BOD    DO   DS TURB

111270 UT45  3.2    9.0 7.70 1105                                    87     1.15      0.06                   9.0  673  190
112670 UT45  2.9    8.0 7.70  428                                   150     0.04      0.13                   9.0  824  270
113070 UT45  3.4 *      8.25 1435 456 407 175   74   54 19 546  5.4  130 181 0.79      2.50        2300  4.1
121070 UT45  3.6    7.0 7.75 1246                                   125     1.90      0.21                   8.0        28
122370 UT45  3.5 *  6.0 7.85 1286                                   125     0.53      0.17                   9.0  839
 10471 UT45  3.1 *                                                                                      6.5
 10571 UT45  3.1 *                                                                                 430
 11471 UT45  2.8    5.0 7.85 1396                                   138     1.64      3.90                   7.0  957   15
 20271 UT45  3.0 *  8.0 8.55 1296                                           1.45      1.60                   7.0 1150
 20671 UT45  3.1 *      7.90 1480 461 524 125   98   68  5 558  2.4  103 235 2.26      0.10         930  4.8
 30271 UT45  2.8 *      7.90 1315 420 479 105   93   60  4 509  2.2  100 202 2.21      0.20         430  5.0
 30471 UT45  2.8 *      7.75 1185                                           2.66 0.02 0.11
 31171 UT45  2.9 *      7.97 1085                                           2.07      0.15                         897
 32571 UT45  2.5 *      7.80 1165                                           2.13      0.24                         874
 40671 UT45  2.9 *      8.00 1300 435 497 120   92   65  4 526  2.9   82 202 2.49      0.20         430  5.0      1097
 42771 UT45  3.2 *      7.90      312 395 190   76   50 10 381  1.4   96 408 0.78 0.08 0.31                       1212
 60371 UT45 11.9 *      7.77  890                                           0.96      0.32
 61571 UT45  4.3        8.05  860                                                     0.35
 62271 UT45  7.1        7.95  840                                                     0.52
 62971 UT45  7.0        7.75 1005                                                     0.23
 71371 UT45  6.2        7.80  820                                                     0.52
 72071 UT45  6.7        7.80  800                                                     0.44
 72971 UT45             7.90  930                                                     1.84
 40572 UT45 05.6   14.5       443     159 024   16   29 04           022     1.30      0.08             01.1
 41972 UT45 05.2   10.4           331 318 023   83   27 05 405       021     1.25      0.03             00.3       565
 31672 UT46 03.0   14.0           357 436 200   93   50 04 436       058 175 1.50      0.08             01.1      1017
 32372 UT46 03.2   12.0           281 428 085   94   47 05 343       053 133 1.90      0.11             01.9       762
 33072 UT46 03.0   12.0
 40572 UT46 03.3   11.0               244 084   22   46 03                   1.68                       01.0
 41372 UT46 03.3   09.0       680 341 336 058   77   35 03 417       040 098           0.08             03.2       728
 41972 UT46 03.4   11.0           304 269 046   70   23 03 372       031      1.05      0.05             01.5       546
 50372 UT46 03.9   16.0       950 354 347 080   73   40 08 433       046 103 1.60      0.21             02.4      0785
 51072 UT46 03.9   17.0       605 326 393 036   80   47 07 398       023      0.75      0.22             03.1       592
 81969 UT47        23.3 9.50                                                                                16.4       019
 82669 UT47        22.1 8.30                                                                                07.4       018
 90269 UT47        23.3 9.60                                                                                14.2       022
 90969 UT47        19.7 8.80                                                                                07.2       020
 20271 UT47 20.5 *  6.0 9.05 1708                                           0.68      0.44                   8.0 1150
 21671 UT47 22.8 *  9.0 6.20 1445 387                     473  3.5          3.10 0.30 2.05                   9.0 1010
 30471 UT47 19.7 *      8.26 1305                                           3.18 0.52 2.08
 31171 UT47 20.6 *      8.10 1325                                           2.66 0.66 2.27
 31871 UT47 19.9 *      8.02 1180                                           2.86 0.67 2.18                         936
 32571 UT47 19.7 *      8.10 1265                                           2.63 0.01 2.05                         922
 40171 UT47 18.3 *      8.00 1365                                           3.62      2.85                         800
 42271 UT47 21.[illegible] *      8.25 1525                                           1.97 0.15 1.81                        1172
 42771 UT47 21.4 *      8.30 1365                                       251 2.96 1.44 2.70                        1186
 50371 UT47 11.6 *      8.22 1135                                           2.35 0.47 2.68
 51371 UT47  1.1 *      8.20  800                                           2.30 0.03 1.42
 52071 UT47  1.1 *      8.80 1125                                           2.74 0.30 2.48
 61571 UT47 20.6 *      8.07  990                                                     2.82
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62271	UT47	.5		8.00	980													4.17						
62971	UT47	7.0		8.00	900													1.26						
71371	UT47	5.4		7.90	910													2.71						
72071	UT47	1.0 *		8.00	960													1.78						
72971	UT47	17.9 *		8.10	1015													5.76						
80471	UT47	8.1 *		7.90	1145													3.44						
31672	UT47	37.0	16.0			441	341	156	56	49	12	539		092	119	1.56		0.44			06.3		1027	
32372	UT47	37.0	10.0				393	136	80	47	15			123	145	2.40		1.78			02.3			
33072	UT47	38.2	11.0			477						582		109		2.44		1.40			05.6			
40572	UT47	17.2	13.0		691		220	076	34	33	06					1.94		0.53						
41372	UT47	18.0	08.0			126	174	082	27	26	06	154			831						03.9			
41972	UT47	21.0	07.0			403	250	210	59	25	09	492		142		1.90		0.75			06.0		940	
42672	UT47	17.2	10.5		994	362	328	122	72	36	10	442		094	136	2.26		1.14			07.0		915	
50372	UT47	16.6	15.5																					
51072	UT47	16.5	17.0		994	412	373	115	77	44	09	503		076		3.56		0.08			04.1		828	
81969	UT48		24.2	8.80																				031
82669	UT48		25.3	8.60																				025
90269	UT48		23.9	8.90																				032
90969	UT48		21.2	8.50																		06.4		022
50570	UT48	119.		8.10	630	222	271	40	69	24	3	267	1.9	42	75	0.36		0.20		9300	7.8			
60270	UT48	13.		7.70	1100	356	396	120	83	46	5	432	1.2	96	158	0.47		0.20		9300	8.9			
61670	UT48	101.					269	38	65	26	6			32										
63070	UT48	3.		7.85	675	240	270	45	59	30	4	291	1.1	47	76	0.36		0.20		3000	9.3			
70470	UT48	2.				326	447	182	90	54	10	398		123	190	0.29		1.20						
71470	UT48	1.				325	453	173	91	55	9	397		111	223	0.54		0.30						
71770	UT48	3.	22.0	7.55	470		240									0.31		0.17				6.0	518	120
73170	UT48	5.	18.5	7.80												1.00		0.90				5.5	802	
80470	UT48	10.																			2.4			
91170	UT48	3.				166	189	21	46	18	6	177	13.0	21	55	0.38		0.60						
31470	UT48		21.5	8.20										100		0.66		0.11				9.0		65
82870	UT48	17.	18.5	7.85										75		0.28		0.07				7.0	868	190
90170	UT48	6.		8.20	875	277	298	90	57	38	3	333	2.9		117	0.45		0.50	0.37		8.3			
92370	UT48	54.		8.10		147	268	50	63	27	5	180	1.0	39	86	0.36				3				
100570	UT48	33.																		3000	6.4			
101570	UT48		6.0	8.10										87		0.35		0.40				10.0	524	35
102970	UT48		4.0	8.22	814									75		0.30		0.07				11.0	481	23
110270	UT48	78.		8.10	785	246	293	45	68	30	4	296	2.1	61	101	0.34				7500	3.3			
111270	UT48		5.5	8.25	905									75		0.13		0.07				7.0	489	35
111670	UT48	85.		8.30		214	310	65	73	31	7	262	2.4	53	101	0.45								
112670	UT48		7.0	8.10										63		0.06		0.04				9.0	483	260
113070	UT48	101.		7.95	855	258	318	70	78	30	5	312	1.5	70	113	0.45		0.20		5000	10.8			
121070	UT48		2.5	8.20	710									75		0.33		0.05				10.0		50
121470	UT48	89.		8.30		196		93		34	5	235	2.2	69	117	0.61								
122370	UT48		3.0	8.20	771									75		0.22		0.10				8.0	487	
10471	UT48	131.																		7500				
11471	UT48			8.35	710									88		0.33		0.10				9.0	499	
11671	UT48	115.		8.50	610	183	347	47	88	31		224	3.3	57		0.59	0.06	0.26					509	
20271	UT48		5.0	9.00	791											0.32		0.08				8.0	485	
20871	UT43	116.		8.10	880	274	329	60	74	35	5	330	2.3	70	105	0.50		0.10		930	10.2			
21671	UT48	135.	6.5	8.18	710	219						268	1.9			0.58	0.10	0.62				7.0	494	

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30271	UT48	100.		7.90	800	258	319	55	72	34	5	313	1.4	73	109	0.59		0.10		230	3.8		663	
30471	UT48	113.		8.25	770											0.62	0.04	0.						
31171	UT48	125.		8.20	720											0.55	0.04	0.12					561	
31871	UT48	129.		8.13	720											0.51		0.14					532	
32571	UT48	191.		8.00	590											0.45		0.14					416	
40171	UT48	212.		8.20	580											0.42	0.05	0.18					404	
40671	UT48	214.		8.25	625	237	266	40	64	26	3	284	2.8	31	63	0.45		0.10		930	10.3			
42271	UT48	191.		8.35	550											0.34	0.03	0.15					383	
42771	UT48	263.		8.30	480	186	250	37	59	25	6	227	2.1	27	95	1.05	0.04	0.24					477	
51371	UT48	207.		8.30	470	208						236	9.0			0.37		0.21						
52071	UT48	126.		8.40	520									26		0.47		0.28						
60871	UT48			8.02	630											0.52		0.19						
61571	UT48			8.20	1325													0.26						
62271	UT48			8.10	470													0.23						
62971	UT48			7.93	1065													0.12						
71371	UT48			7.90	580													0.22						
72071	UT48			7.90	510													0.40						
72971	UT48			8.10	890													1.42						
31672	UT48	168.	07.0			282	310	048	78	28	04	[illegible]		033	071	0.42		0.03			01.8		607	
32372	UT48	178.	04.0																					
33072	UT48	155.	07.0			213	259	055	56	29	04	261		040	081	0.44		0.04			00.0		526	
40572	UT48	103.	10.0		518		181	048	25	29	03			043		0.36		0.06					0457	
41372	UT48	130.	04.0			261	276	042	71	24	03	[illegible]		033	072	0.36					02.7			
41972	UT48	166.	06.5			295	258	038	64	24	03	[illegible]		033		0.24		0.04			01.0		520	
42672	UT48	112.	09.0		594	269	276	041	68	26	03	321		033	067	0.33		0.06			01.0		0710	
50372	UT48	18.	14.5		907	337	340	073	82	33	05	412		050	109	0.42		0.10			01.2		765	
51072	UT48	32.	13.0		670	275	281	047	70	26	02	306				0.47					00.7		476	
40572	UT49	00.6	13.2				628	504	59	117	05					0.27					02.1			
41972	UT49	01.1	08.7			495	448	343	64	73	20	635		271		1.42		0.62			02.1		1367	
51072	UT49	00.7	19.0		1998	471	579	328	77	94	12	575		282		0.66		0.55			05.9		1369	
31672	UT50	02.6	17.0			762		650	138	[illegible]	10	930		650	856	0.70		0.13			02.4		3434	
32372	UT50	02.6	12.0			231	866	646	85	154	10	283		636	725	0.42		0.40			01.8			
33072	UT50	02.7	14.0			560		689	139	103	10	693		665	822	0.45		0.11			01.2		3202	
40572	UT50	02.5	14.5					718	83	233	09			376		0.40		0.17			01.0			
41372	UT50	02.7	11.0			610	390	540	130	16	13	745		235	895	0.74		0.10			01.9			
41972	UT50	03.2	10.0			600		663	145	229	11	733		935		0.49		0.04			01.2		3908	
50372	UT50	04.1	18.5																					
51072	UT50	06.0	16.4			554	648	382	93	101	12	677		352		0.97		0.22			02.5			
82669	UT51		24.9	8.70																				323
90269	UT51		22.9	8.70																				030
90969	UT51		22.5	8.50																		07.2		030
50570	UT51			8.25	1335	397	458	125	70	69	14	476	4.7	121	183	1.58		0.60		930	4.0		1719	
60270	UT51			7.95	1600	442	541	183	65	80	18	534	2.6	164	277	0.77		0.50		7500	6.0			
61670	UT51	48.1 *					449	139	81	60	18			106										
63070	UT51	15.4 *		8.30	1750	460	536	190	83	80	18	550	6.1	65	307	0.81		0.20		2000	4.8			
70470	UT51	15.5 *				348	654	265	99	99	22	425		256	346	0.61		0.40						
71470	UT51	26.6 *				333	519	177	86	74	19	407		131	250	1.45		0.90						
71770	UT51	18.5	21.0	7.85	980		394									1.05		0.35				5.0	1116	140
73170	UT51	30.5	19.5	7.60			325									0.63		0.18				5.0	1345	45
80470	UT51	29.3 *																			4.1			

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81170	UT51	18.6				323	389	192	44	68	13	378	8.0	155	278	0.66		0.80						
81470	UT51	18.8	20.0	7.75										350		1.20		0.41						45
82670	UT51	39.5	19.5	7.85										175		0.35		0.15				5.0	906	185
90170	UT51	45.6 *		8.10	1215	400	425	140	75	59	16	482	3.3	110	173	0.68		1.00	0.51	9300	5.8			
90970	UT51		22.5	8.50																		07.2		030
92370	UT51	52.3 *		8.70		269	408	44	73	55	15	306	11.0	78	152	0.81		0.70						
100570	UT51	54.3 *																		2300	5.7			
101570	UT51	56.4 *	7.0	7.85										137		0.75		1.25				9.0	782	45
102970	UT51	60.3 *	4.5	8.10	1346									137		0.60		0.95				10.0	848	5
110270	UT51	57.6 *		8.50		306	357	130	49	57	17	346	14.0	80	182	1.39		1.00		4300	4.2			
110270	UT51	57.6 *		8.50	1045	384	394	85	64	57	15	453	7.9	80	130	1.31		0.40		4300	4.2			
111270	UT51	75.0	5.5	8.20	1588									137		0.95		0.45				8.0	874	50
111670	UT51	70.2 *		8.20		188	492	150	80	71	27	230	1.7	238	183	1.21		0.30						
112670	UT51	71.0	7.0	7.80										125		0.03		0.05				7.0	800	90
113070	UT51	70.2 *		8.20	1435	472	468	155	72	70	22	566	4.9	122	194	0.97		0.80		4300	10.9			
121070	UT51	67.0	2.0	7.95	1266									125		0.87		0.17				8.0		45
122370	UT51	59.3 *	1.0	8.10	1407									187		0.45		0.35				9.0	1017	
11471	UT51		0.0	8.20	1145									112		0.95		0.45				8.0	781	
11671	UT51			8.52	1040	329	558	79	113	67		384	9.0	97		1.56	0.18	0.94					900	
20271	UT51	61.0 *	5.0	8.80	1507											1.70		0.26				6.0	926	
20871	UT51	74.6 *																		430	8.0			
21671	UT51	65.4 *	8.0	8.20	1335	378						444	9.0			1.22	0.05	1.20					1052	
30271	UT51	57.6 *		8.10	1170	400	432	100	79	57	5	482	3.3	90	140	1.27		0.80		4300	6.9		958	
30471	UT51	60.7 *		8.10	1255											1.64	0.08	1.52						
30871	UT51	50.0 *		0.																			923	
31171	UT51	69.2 *		8.27	1165											1.31	0.10	0.35					976	
31871	UT51	64.2 *		8.08	1210											1.74	0.03	0.50					980	
32571	UT51	62.9 *		8.00	1085											1.22	0.13	0.49					804	
40171	UT51	65.1 *		8.34	980											1.56	0.01	0.55					729	
40571	UT51	62.9 *		8.15	1045	333	386	80	74	49	8	400	3.1	73	13	1.13		0.40		5000	7.9		702	
42271	UT51	72.8 *		8.00	1325											0.89	0.09	0.63					1002	
42971	UT51	77.1 *		8.30	920	338	435	132	72	62	26	413	3.8	92	130	1.13	0.09	0.44					899	
51371	UT51	46.0 *		8.20	970	283						341	2.5			0.66		0.26						
52071	UT51	37.0 *		8.50	1335									147		0.80		0.37						
60871	UT51	35.1 *		8.05	1395											0.73		0.79						
61571	UT51	45.3		8.20	1215													0.41						
62271	UT51	56.3		8.10	2210													0.95						
62971	UT51	10.5		8.17	2305													0.24						
71371	UT51	15.5 *		8.10	1990													0.47						
72071	UT51	20.0		8.00	1600													1.36						
72971	UT51	.16.4 *		8.20	1525													3.60						
31672	UT51	60.0	12.0			418	418	098	85	50	09	510		061	115	1.45		0.23			03.9		930	
32372	UT51	60.0	10.0			250	284	077	38	46	09	306		058	108	1.14		0.25			00.5		643	
33072	UT51	47.5	12.0			430	463	115	90	58	12	525		082	157	1.92		0.29			01.9		1041	
40572	UT51	45.2	12.2			0	347	130	32	65	13	0		106		1.18		0.08			00.7		0833	
41372	UT51	45.3	10.0		1015	301	282	129	19	57	20	368		107	169	1.25		0.10			02.5		870	
41972	UT51	45.2	08.0			459	438	108	80	58	14	561		083		1.26		0.10			01.4		935	
42672	UT51	39.0	11.0		1210	460	460	124	79	64	16	562		096	166	1.26		0.22			02.7		1058	
50372	UT51	55.0	17.0		1598	809	565	185	96	78	14	988		156	263	1.03		0.29			02.7		1783	
51072	UT51	30.0	18.0		1577	522	638	213	76	109	15	637		204		0.62		0.51			02.6		1255	

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  DATE  STA  FLOW    TEMP    PH  COND  AL HARD  NA  CA  MG  K HCO3  CO3   CL SO4  NO3  NH3  PO4    F COLF  BOD   DO   DS TURB

 32972 UT52  06.6    09.5        5940 389                      475      1788     0.03      0.09           01.2      3951
 40672 UT52  07.2    20.0                  351 552  37  63 25            745     0.01                     00.2
 42072 UT52  13.7    18.5        6372 389  734 242  52 147 25  475      1630     0.10      0.03           01.5      2819
 50570 UT53  505.          8.35  1280 204  354 140  58  51 25  243  3.0  180 210 0.57                 150  6.9
 60270 UT53  793.                                                                                    430  4.8
 61670 UT53  415.                          375 149  63  53 22            178
 62170 UT53  758.          8.20  1350 205  365 145  59  53 18  246  2.1  190 217 0.50
 63070 UT53  786.          8.25  1335 205  366 145  61  52 19  246  2.4  198 230 0.36      0.20        93  6.4
 70470 UT53  911.                     166  373 167  62  53 22  203       193     0.18      1.00
 71470 UT53  756.                     160  411 191  66  60 22  196       195 219 0.50      0.30
 72770 UT53  830.    18.5  8.45   730      154                                   0.75      0.08                  6.0  997   75
 73170 UT53  772.                                                                                                       870
 80470 UT53  814.                          4.9
 81170 UT53  836.                     159  372 164  52  59 30  194       210 241 0.52      1.00
 81470 UT53  838.          8.50                          9
 82670 UT53  807.          8.45                      5 5 9
 90170 UT53  769.          7.55  1350 180  398 175  46  69 22  220  0.4  220 240 0.05      0.50 0.65  930  5.3
 92370 UT53  610.          8.50       180  353 178  46  58 21  175  2.0  209 243 0.00      0.20
100570 UT53  510.                                                                                     93  6.0
101570 UT53           8.5  8.50                                          288     0.17      0.04                 10.0        45
102970 UT53           5.5  8.33 .1467                                    275     0.36      0.10                  9.0        22
110270 UT53  133.          8.10       132  392 252  55  62 27  162       203 232 0.51      0.60        93  7.0
110270 UT53  103.          8.20  1335 206  366 150  51  58 17  247  2.2  208 236 0.43      0.10 0.64   93  7.0
111270 UT53           5.0  8.25  1588   0                                288     0.31      0.34                  8.0  896   48
111670 UT53  156.          8.20       161  382 200  51  62 25  197       217 243 0.57      0.20
112670 UT53           6.0  8.10  1005                                    225     0.75      0.12                  9.0  845   80
113070 UT53  269.          8.30  1410 209  402 160  64  59 18  250  2.7  220 257 0.75      0.40       110  4.6
121070 UT53           3.0  8.25  1246                                    300     0.68      0.05                  8.0        57
122370 UT53           0.5  8.20  1286                                    300     0.33      0.08                 10.0  878
 10471 UT53  361.          8.20  1450 220  390 165  56  61 18  264  2.3  211 242 0.90      0.20 0.63   93  4.3      1021   13
 11471 UT53           2.0  8.75  1226                                    288     0.52      0.17                 10.0  888
 20871 UT53  456.                                                                                     43  4.5
 21171 UT53           5.0  8.15                                                  0.56      0.18                  8.0  896
 21871 UT53  452.     4.0  8.10  1175                                            0.48 0.10 0.29                  9.0  867
 30271 UT53  320.          8.25  1350 203  360 135  57  53 16  243  2.4  193 219 0.41                 143  9.4
 30471 UT53  495.          8.45  1226                                            0.59 0.16
 31171 UT53  538.          8.05  1005                                            0.43 0.30 0.18                       803
 31871 UT53  504.          8.22  1100                                            0.35 0.18 0.07                       898
 32571 UT53  538.          8.20  1095                                            0.31 0.14 0.14                       836
 40171 UT53  522.          8.20  1065                                            0.36 0.06 1.56                       834
 40671 UT53  517.          8.35  1350 201  357 145  54  54 16  240  3.0  195 223 0.54                   9  5.0       921
 41571 UT53                8.15  1095                                            0.52      0.08                       906
 42771 UT53  553. *        8.10       186  378 132  66  52 24  227       155 218 0.73 0.26 0.17                       875
 51071 UT53  578. *        8.40  1085 162                      194  2.2          0.47      0.24
 52071 UT53  649. *        8.30  1105                                    180     0.50      0.18
 60871 UT53  654. *        7.93  1135                                            0.58      0.18
 61571 UT53  515. *        8.20  1155                                                      0.32
 62271 UT53  749. *        8.40  1145                                                      0.16
 62971 UT53  741. *        8.28  1200                                                      0.18
 71371 UT53  768. *        8.20  1125                                                      0.32
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DATE  STA  FLOW   TEMP  PH  COND AL HARD  NA  CA  MG  K HCO3 CO3  CL  SO4  NO3  NH3  PO4   F   COLF  BOD   DO  DS TURB

72071 UT53 848. *      8.20 1185                                                    0.55
72971 UT53 819. *      8.20 1235                                                    1.92
31672 UT53 495.  10.0            136 341 158  64  44 15 166      166 199 0.11       0.10                           0784
32372 UT53 448.  11.0            241 368 153  60  53 17 295      180 217 0.20       0.13             00.4           975
33072 UT53 438.  07.0            231 360 139  62  50 16 283      179 211 0.19       0.04             01.4           940
40572 UT53 471.  10.0       1080     344 130  31  65 13          169                0.09             00.1          0835
41372 UT53 356.  08.0       1199 262 373 143  64  52 20 320      181 220 0.24       0.23             01.5          1135
41972 UT53 452.  07.2            237 382 139  61  56 18 290      179     0.22       0.08             00.9          0808
42672 UT53 417.  11.0       1210 237 373 153  59  55 17 290      183 221 0.15                        01.1          1073
50372 UT53 574.  12.5       1210 213 393 155  70  53 17 261      186 226            0.10             01.8           968
51072 UT53 738.  13.5       1188 227 406 148  64  60 15 278      179     0.32       0.09             01.3           744
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DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
82669	UT61		26.9	8.70																		00.0		066
90269	UT61		22.5																			00.0		051
90969	UT61		24.5	8.40																		07.3		
50570	UT61			7.75	85	31	40	5	8	5	2	38	0.1	11	9	0.14		0.10		150	5.7			
60270	UT61			7.60	59	22	21	3	7	1	0	27		10	2	0.14				43	4.5			
61670	UT61						33	5	10	2	2			2										
63070	UT61			7.20	98	37	37	5	10	3	1	46		14	4	0.14		0.20		930	3.0			
71070	UT61		14.3	7.50			51									0.15		0.12				8.0	90	8
71470	UT61					61	75	17	22	5	2	75		8	12	0.16		0.20						
80470	UT61																				3.1			
80770	UT61		14.5	7.85			68									0.29		0.03				9.0	85	
81170	UT61					41	49	5	15	3	2	51		4	14	0.00		0.80						
82170	UT61		13.5	7.85										25		0.33		0.14				9.0	84	
90170	UT61			7.95	165	75	86	7	18	10	1	91	0.5	19	7	0.16		0.20	0.25	7300	3.0			
90470	UT61		13.0	7.95										25		0.13		0.25				9.0	126	35
92370	UT61			7.90		56	70	8	20	5	2	69	0.2	4	7			0.20						
100170	UT61		9.0	7.95	159											0.04		0.02				10.0	53	5
100570	UT61																			930	5.2			
102270	UT61		6.5	7.70										12		.015		0.08				10.0	88	5
110270	UT61			7.90	125	53	57	11	13	6	2	65	0.3	20	7	0.14		0.10	0.22	210	3.6			
110570	UT61		6.5	7.95	134									12		0.02		0.03				9.0	90	
111670	UT61			7.50		47	57	2	18	3	2	58		4	4	0.13		0.40						
111970	UT61		2.0	8.20	115											0.08		0.02				12.0	88	
112770	UT61		5.0	7.90	131											0.04		0.04				10.0	89	
113070	UT61			8.20	140	56	62	6	15	6	2	68	0.6	19	5	0.18		0.30		430	4.0			
120370	UT61		2.0	7.85	115											0.03		0.03					75	
121770	UT61		3.0	7.95	129									12		0.15		0.03				9.0	97	
122370	UT61		0.5	7.85	135									12		0.10		0.09				11.0	103	
10471	UT61			7.85	150	68	65	7	17	5	2	82	0.3	15	7	0.30		0.20	0.23	43	2.3		110	3
10771	UT61		-.5	7.95	121											0.11		0.09					98	
12871	UT61		3.0	7.95	134											0.16		0.12				10.0	77	
20371	UT61			7.80	130	51	49	6	15	3	2	63	0.2	15	6	0.00		0.10			2.0			
21171	UT61		3.0	8.15												0.11		0.27				9.0	86	
30271	UT61			8.00	140	56	56	5	16	4	2	68	0.4	17	7	0.16		0.20		93	6.2		52	
40671	UT61			7.70	99	33	32	5	8	3	2	41		4	7	0.18		0.10		150	3.8		54	
42771	UT61			7.80	89	41	51	7	14	4	3	50	0.1	3	003	0.20	0.01	0.07					84	
60371	UT61			6.68	80											0.15		0.13						
82669	UT62		29.8	9.00																		16.2		030
90269	UT62		24.0	8.90																		15.6		035
90969	UT62		24.6	8.60																		18.0		030
50570	UT62																			230	3.8			
60270	UT62			8.25	255	112	138	2	39	10	0	134	1.3	16	18	0.20				150	4.0			
61670	UT62						164	3	51	9	1			3										
63070	UT62			8.20	290	121	154	2	42	12	1	145	1.3	13	27	0.18		0.10		430	4.2			
71070	UT62		12.6	8.60			137									0.09		0.03				9.0	223	
71470	UT62					111	198	6	58	13	1	136		4	39	0.25		0.10						
80470	UT62																				4.0			
80770	UT62		13.0	8.20			102									1.50		0.05				8.0	255	
81170	UT62					109	181	3	40	15	2	134		4	73			0.50			4.0			
82170	UT62		12.5	8.20										25		0.33		0.07				9.0	232	

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
90170	UT62			7.75	415	148	237	3	62	20	1	180	0.6	17	76	0.14		0.40	0.26	2300	5.0			
90470	UT62		12.0	8.25										25		0.12		0.04				9.0	276	
92370	UT62			8.40		146	231	3	63	18	1	168	5.0	3	81									
100170	UT62		9.0	8.40	507											0.08		0.02				9.0	254	
100570	UT62																			430	5.2			
102770	UT62		7.5	8.09										12		.030		0.06				10.0	406	8
110270	UT62			8.05	435	152	250	4	64	22	3	184	1.1	16	90	0.14		0.10	0.29	150	4.2			
110570	UT62		7.5	8.45	497									12		0.03		0.04				10.0	308	
111670	UT62			8.20		140	249	3	67	20	1	169	1.2	3	84	0.07		0.70						
111970	UT62		4.0	8.25	446											0.08		0.03				9.0	288	4
112770	UT62		7.0	8.15	487									12		0.09		0.05				10.0	297	
120370	UT62		6.0	8.40	447											.055		0.26					185	
121770	UT62		3.5	8.50	456									25		0.13		0.05				10.0	334	
122370	UT62		1.0	8.20	446									12		0.12		0.04				11.0	321	
10471	UT62			8.35	510	174	284	7	74	24	2	207	2.6	19	105	0.18		1.10	0.31	9300	2.6		442	1
10771	UT62		.5	8.40	426											0.11		0.04				10.0	337	
12871	UT62		4.0	8.40	450											0.11		0.05				8.0	302	
20871	UT62			8.00	480	161	255	4	66	22	2	194	1.2	19	90	0.75				750	2.4			
21171	UT62		4.5	8.55												0.08		0.06				10.0	328	
30271	UT62			8.30	485	159	262	4	67	23	1	190	2.1	19	99	0.07				93	3.6		405	
31371	UT62																						602	
40671	UT62			8.40	430	154	225	3	59	19	2	183	2.5	20	72	0.16				93	6.3			
42771	UT62			8.30	330	146	216	4	62	15	1	175	1.6	4	113	0.20	0.09	0.09					229	
60871	UT62			7.92	265											0.23		0.08						
82669	UT63		27.2	8.70																		12.4		054
90269	UT63		23.5	8.80																		13.6		044
90969	UT63		23.4	8.60																		12.4		039
50570	UT63			8.25	430	182	219	9	60	17	2	218	2.1	20	35	0.45				23	6.9			
60270	UT63			8.20	425	168	220	11	62	16	2	202	1.8	20	52	0.29				430	4.0			
61670	UT63						173	10	53	10	4			10										
63070	UT63			8.00	360	135	177	8	48	14	2	164	0.9	18	36	0.36		0.20		750	7.2			
71070	UT63		14.3	7.80			171									0.30		0.04				9.0	219	
71470	UT63					142	234	46	66	17	2	174		13	37	0.36		0.50						
80470	UT63																				7.1			
80770	UT63		12.5	7.65			120									0.53		0.03				8.0	252	
81170	UT63					147	186	9	50	15	3	180		12	53	0.25		0.30						
82170	UT63		12.5	7.20										25		0.41		0.02				7.0	262	
90170	UT63			6.35	415	180	228	10	60	19	1	215	2.7	24	34	0.32		0.60	0.21	230	6.1			
90470	UT63		12.5	7.50										38		0.24		0.03				7.0	380	
92370	UT63			7.90		140	221	9	64	15	2	170	0.6	8	33	0.13		0.10						
100170	UT63		12.5	7.95	446									25		0.31						10.0	230	
100570	UT63																			2300	6.3			
102270	UT63		9.5	7.70										25		.038		0.06				9.0	237	5
110270	UT63			8.30		142	186	9	50	15	2	170	1.5	8	22	0.13		0.10		9300	5.2			
110270	UT63			8.30	350	165	184	7	49	15	4	197	2.2	20	25	0.20		0.00	0.16	9300	5.2			
110570	UT63		8.0	8.25	410									12		0.16		0.06				11.0	221	
111670	UT63			8.10		141	187	8	52	14	2	170	1.0	6	30	0.28		0.70						
111970	UT63		5.0	8.20	325											0.19		0.05				10.0	212	5
112770	UT63		6.5	7.80	467									25		0.16		0.04				10.0	237	5
113070	UT63			7.80	390	152	199	9	52	17	3	185	0.6	22	47	0.25		0.30		430	6.0			

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  DATE  STA  FLOW  TEMP   PH COND  AL HARD  NA  CA  MG  K HCO3  CO3  CL  SO4  NO3  NH3  PO4    F  COLF  BOD   DO  DS TURB
120370 UT63         4.0 7.85  345                                            0.17       0.03                      208
121470 UT63             8.20       120  196  49  54  15  2  145  1.0   5   29 0.19       1.10
121770 UT63         3.5 8.25  325                                    12       0.25       0.05                  9.0 223
122371 UT63         3.0       345                                    12       0.11       0.05                 10.0 155
 10471 UT63             8.10  395 175  208   7  53  18 02  211  1.5  20   31 0.14           0.15   430  3.0      344    1
 10771 UT63         1.0 7.90  325                                    12       0.22       0.04                 10.0 211
 11671 UT63             8.55  285 144  183   9  52  13     170  2.8  11      0.27 0.01 0.24                      294
 12871 UT63         4.0 8.25  349                                            0.22       0.08                  9.0 207
 20371 UT63             8.25  385 167  201   7  51  18  2  199  2.8  23   29 0.39       0.10        930  3.8
 21171 UT63         4.0 8.20                                                 0.26       0.06                  9.0 243
 30271 UT63             8.40  370 160  188   7  49  16  2  191  2.6  24   28 0.11                   43  4.3      320
 40671 UT63             8.35  385 163  201   6  51  18  2  195  2.4   8   26 0.27       0.10         23  3.2      309
 42771 UT63             8.20  330 139  207  12  60  14  5  168  1.2  11   50 0.30 0.03 0.06                      320
 60871 UT63             8.18  320                                            0.22       0.02
 50570 UT64             8.30  305 116  155   7  49   8  1  139  1.5  19   39 0.07       0.10        930  4.6
 60270 UT64             8.05  355 132  187   7  57  11  1  160  1.0  18   50 0.14       0.10        230  4.8
 61670 UT64                            226  10  74  10  3            80
 63070 UT64             8.00  525 167  260  12  78  16  2  202  1.1  18  102 0.16       0.20        430  4.0
 71070 UT64        15.8 8.30           188                                   0.05       0.03                  9.0 369
 71470 UT64                       131  295  50  87  19  2  161       13  109 0.09       0.10
 80770 UT64        16.0 7.80           120                                   0.15                            8.0 421
 81170 UT64                       133  269  16  78  18  3  163       13  156 0.00       0.50
 82170 UT64        14.0 8.15                                         38       0.30       0.04                      409
 90170 UT64             7.85  600 160  306  16  88  21  1  194  0.8  24  153 0.11       0.70 0.27   230  4.0
 90470 UT64        15.0 8.05                                         25       0.05       0.03                  9.0 434
 92370 UT64             7.90      110  284  23  81  20  1  134  0.5  11  140           0.40
100170 UT64         8.0 8.20  669                                    25       0.06       0.03                 10.0 249   20
100570 UT64                                                                                        430 10.4
102270 UT64         8.0 8.15                                         25       .004       0.06                  9.0 444    9
110270 UT64             7.90  600 102  308  16  89  21  5  221  1.0  23  147 0.05           0.27   430  3.0
110570 UT64         7.5 8.35  711                                    25       0.03       0.03                 10.0 436
111670 UT64             7.80      159  274  19  77  20  3  193  0.5  10  141           0.40
111970 UT64         4.0 8.25  619                                            0.04       0.04                 10.0 422
112670 UT64         5.0 8.00                                                                                 9.0 385
113370 UT64             8.25  620 200  318  20  96  19  2  240  2.4  25  142 0.16       0.20        930  3.9
120370 UT64         3.0 8.25  624                                            0.05       0.02
120571 UT64         3.0 8.25  629                                            0.05       0.32                      389
121770 UT64         2.5 8.40  558                                    38       0.14       0.08                  7.0 423
122270 UT64         2.5 8.20  507                                    25       0.11       0.15                 10.0 405
 10471 UT64                                                                                             5.0
 10571 UT64             7.90  480 206  266   9  77  18 02  249  1.1  17   61 0.41       0.20 0.15   930           435    1
 10771 UT64         -.5       518                                    25       0.13       0.03                      366
 12871 UT64         2.5 8.45  550                                    25       0.10       0.11                  9.0 406
 30271 UT64             7.90  555 160  260  15  73  19 15  194  0.9  27  104 0.11                   43  6.5      448
 40671 UT64             8.35  300 114  152   8  46   9  1  136  1.7   5   39 0.18       0.10         23  4.7      246
 42771 UT64             8.20  265 128  187   9  60   9  3  154  1.1   4  110 0.12 0.01 0.10                      349
 60871 UT64             8.10  410                                                      0.11
 82669 UT65        24.9 8.70                                                                                10.0      022
 90269 UT65        21.5 8.60                                                                                07.2      018
 90969 UT65        21.0 8.40                                                                                05.6      020
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DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO2	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
50570	UT65			8.25	565	224	261	35	65	24	3	269	2.6	40	51	0.23				1500	4.5			
60270	UT65																			4300	3.8			
61670	UT65						237	30	57	23	5			28										
63070	UT65			8.25	410	179	197	17	46	20	2	215	2.1	25	28	0.18		0.20		2306	3.9			
71070	UT65		19.4	8.15			188									0.03		0.02				8.0	244	170
71470	UT65					140	196	50	49	18	3	172		14	29	0.20		0.20						
80470	UT65																				3.2			
80770	UT65		18.0	7.60			120									0.40		0.07				7.0	273	85
81170	UT65					139	170	16	42	16	4	170		15	38									
82170	UT65		19.0											38		0.60		0.42				8.0	232	500
90170	UT65			8.30	425	171	208	19	49	21	1	204	2.3	30	37	0.11		0.60	0.21	9300	3.9			
90470	UT65		17.5	8.15										38		0.07		0.02				7.0	260	105
92370	UT65			8.00		113	212	34	52	20	4	137	0.6	29	32			0.50						
100170	UT65		8.5	8.20	432									38		0.03		0.02				9.0	270	20
100570	UT65																			930	4.0			
102270	UT65		7.5	8.10										87		.024		0.03				10.0	437	12
110270	UT65			8.50		208	272	52	68	25	6	218	18.0	54	63	0.10		0.10		930	3.8			
110270	UT65			8.10	675	210	257	50	57	28	2	253	1.8	62	82	0.18				930	3.8			
110570	UT65		7.0	8.25	802									87		0.11		0.04				10.0	459	801
111670	UT65			8.10		194	276	57	66	27	6	235	1.3	54	90	0.20								
111970	UT65		3.0	8.15	680											0.08		0.04				9.0	458	13
112670	UT65		6.0	8.10	428									63		0.21		0.08				9.0	450	50
113070	UT65			8.30	745	248	295	55	72	28	4	296	3.3	64	84	0.23		0.20		2300	5.0			
120370	UT65		2.0	8.10	731											0.15		0.07						
120570	UT65		2.0	8.10	730											0.15		0.07					458	
121770	UT65		4.0	8.20	751									87		0.18		0.25				11.0	484	
122270	UT65		2.5	8.15	690									63		0.14	0.18					11.0	476	
10471	UT65																				5.5			
10571	UT65			7.95	820	222	400	40	99	30	4	268	1.3	54	184	1.17			0.33	930			682	5
12871	UT65		2.0	8.40	600									100		0.25		0.16				9.0	481	
20871	UT65			8.15	865	254	315	60	80	28	4	306	2.4	82	99	0.13		0.10		430	4.9			
30271	UT65			8.00	800	224	288	65	66	30	5	271	1.5	80	112	0.23				430	5.3		631	
40671	UT65			8.35	600	230	252	25	60	25	3	274	3.4	28	53	0.68		0.20		230	4.3		472	
42771	UT65			8.30	460	117	233	34	57	22	5	141	1.3	23	122	0.25	0.01	0.17					404	
60371	UT65			8.00	500											0.26		0.12						
82669	UT66		24.0	6.60																		00.0		034
90269	UT66		23.0	8.80																		00.0		037
90969	UT66		21.2	8.40																		05.8		029
50570	UT66			8.35	460	242	265	7	57	30	2	289	3.6	18	20	0.07		0.20		430	3.2			
60270	UT66			7.95	445	231	255	6	53	30	6	279	1.4	20	18	0.07		0.20		93	4.9			
61670	UT66						239	7	48	29	4			7										
63070	UT66			8.40	460	231	250	6	49	31	2	275	3.8	20	19	0.14		0.20		120	3.5			
71070	UT66		24.0	8.00			222									0.01						7.0	269	13
71470	UT66					183	257	9	52	31	3	224		8	24	0.90		0.10						
80470	UT66																				2.8			
80770	UT66		24.5	8.20			154									0.31		0.07				7.0	276	10
81170	UT66					194	208	6	39	27	4	203	17.0	8	26	0.27								
82170	UT66		22.0	8.25										38		0.22		0.02				9.0	249	12
90170	UT66			8.45	435	230	268	7	48	36	1	273	4.2	20	20	0.05		0.20	0.13	3000	3.5			
90470	UT66		20.0	8.00										25		0.13		0.02				7.0	251	10

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
92370	UT66			8.30		145	245	12	52	28	3	174	2.0	6	21					4				
100170	UT66		15.0	8.15	446									25		0.08		1.15				13.0	438	40
103570	UT66																			2300	3.8			
102270	UT66		10.0	8.20										25		.025		0.04				10.0	287	12
110270	UT66			8.25	490	249	272	7	58	31	3	299	2.9	20	20	0.05		0.30		1500	3.0			
110570	UT66		7.0	8.25	498									12		0.02		0.08				11.0	310	15
111670	UT66			8.20		222	286	10	62	32	3	268	1.9	5	28	0.24		1.00						
111970	UT66		4.0	8.20	467											0.03		0.04				10.0	303	10
112670	UT66		7.0	8.00	305									12		0.05		0.06				8.0	299	10
113070	UT66			8.25	530	267	278	8	62	30	3	320	3.2	20	23	0.18		0.20		4300	3.3			
120370	UT66		3.5	8.20	477											0.03		0.02					291	
121770	UT66		3.5	7.90	487									12		0.05		0.04				10.0	315	
122270	UT66		3.0	8.25	477									25		0.05		0.07				11.0	304	
10471	UT66																				8.9			
10571	UT66			8.05	490	264	300	7	62	35	2	318	2.0	16	23	0.11		0.10	0.08	430			465	4
20871	UT66			8.30	490	253	268	9	58	30	3	303	3.3	26	23	0.05		0.00		150	8.5			
12871	UT66		5.0	8.30	450									25		0.09		4.40				12.0	303	
30271	UT66			8.30	460	233	249	7	52	29	2	279	3.1	20	19	0.07				150	6.8		411	
40671	UT66			8.20	450	222	244	6	50	29	2	267	2.3	6	21	0.20				43	4.0		384	
42771	UT66			8.50	420	233	282	9	62	31	4	277	4.1	5	25	0.08	0.05	0.10					413	
60871	UT66			8.18	430													0.13						
81969	UT67		25.2	8.90																		10.2		024
82669	UT67		24.3	8.40																		04.8		026
90269	UT67		24.0	8.90																		11.6		021
90969	UT67		21.3	8.30																		05.8		025
13471	UT67	39.1 *																		9300	17.5			
10571	UT67	38.8 *		7.90	490	186	284	25	81	20	5	226	0.8	32		0.64		4.1					394	12
10571	UT67	38.8 *		7.75	585	236	266	27	67	21	5	287	0.9	41	44	1.22		3.80	0.29				498	
11671	UT67	40.5 *		8.30	500	177	292	22	84	20		212	1.9	36		0.26	3.86	4.4					462	
11871	UT67	40.2 *		8.25	520	186	292	23	79	23		224	1.8	34		1.26	2.78	2.5					446	
20271	UT67	36.4	10.0	8.65	568											1.15		3.70				6.0	387	
21671	UT67	36.9 *	12.0	7.62	560	169						236	0.4			0.93	5.48	5.5				6.0	312	
30471	UT67	41.1 *		7.72	590											0.80	2.55	4.9						
31171	UT67	40.5 *		7.60	580											0.39	4.90	1.96					412	
31871	UT67	43.5 *		7.46	560											0.43	3.33	4.11					401	
32571	UT67	44.1 *		7.50	550											0.57	2.80	3.89					360	
40171	UT67	42.4 *		7.62	550											0.54	2.48	2.68					370	
40671	UT67	39.5 *		[illegible]	550											0.88	0.48	1.98					476	
42271	UT67	41.5		7.55	560											0.48	1.96	3.33					370	
42771	UT67	43.9		7.70	510	185	276	33	71	24	7	225	0.5	35	51	0.61	3.86	3.37					450	
50871	UT67	43.6		7.30	530											0.36	3.92	6.76						
51371	UT67	44.0		7.70	530	196						239	0.5			1.02	1.00	3.06						
52071	UT67	42.3		8.30	530									33		1.08	2.22	3.26						
61571	UT67	47.8		7.37	490													2.53						
62271	UT67	44.7		7.62	590													2.97						
62971	UT67	44.4		7.70	560													2.56						
71371	UT67	51.6		7.60	530													2.94						
72071	UT67	52.2		7.55	540													2.48						
72971	UT67	53.0		7.70	580													3.37						
80471	UT67	56.6		7.30	580													2.41						

DATE	STA	FLOW	TEMP	PH	CONG	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
81969	UT68		25.0	8.90																		12.0		035
82669	UT68		22.8	8.50																		04.2		028
90269	UT68		23.1	8.70																		09.0		016
90969	UT68		21.0	8.40																		05.6		020
121470	UT68			8.20	695	171	213	62	13	44	5	189	10.0	40	262	0.63		0.30						
11671	UT68			8.25	785	188	556	25	152	43		226	1.8	40		0.73	0.07	0.11					750	
42771	UT68			8.00	630	264	403	40	89	44	10	320	1.5	34		2.62	0.06	0.24						
82569	UT69		24.2	8.20																		05.6		033
90269	UT69		22.4	8.40																		07.0		032
90969	UT69		21.2	8.10																		05.7		020
82669	UT70		26.5	8.10																		06.0		015
90269	UT70		22.6	8.60																		08.2		016
90969	UT70		22.0	8.40																		06.9		024
81969	UT71		23.6	8.80																		09.6		035
82669	UT71		24.3	8.60																		08.6		056
90269	UT71		22.5	8.70																		08.8		042
90969	UT71		21.4	8.50																		06.1		029

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
32470	UL 1																		230				
61570	UL 2	18.0	8.35	1000	184	293	92	55	38	13	219	2.7	126	153	0.23		0.1		93	5.9	5.4		
70970	UL 2	25.0	8.30	1280	196	342	140	53	51	19	234	2.6	188	218	0.20		0.5		4	4.7	9.0		
81270	UL 2	25.5	8.60		172	341	160	41	58	20	201	4.4	210	230	0.23		0.2			5.8	5.5		
90870	UL 2		8.50	1280	172	328	160	41	55	21	203	3.5	217	235	0.18		0.4	0.77					
90970	UL 2																			11.2			
61570	UL 4	21.0	8.35	1230	204	345	120	59	49	17	243	3.0	167	200	0.23		0.2		93		8.0		
70870	UL 4	27.0	8.15	1250	202	348	140	54	52	19	243	1.9	184	214	0.11		0.6				12.9		
81270	UL 4	27.0	8.60	1300	172	322	145	40	54	19	202	4.4	201	220	0.23		0.4				5.4		
90870	UL 4		7.80	1250	177	332	150	44	54	20	215	0.8	190	211	0.25		0.5	0.68					
61368	UL 5		8.25	1445	207	363	140	60	52	17	248	2.0	180	223	0.29		0.8	0.68				922	11
61768	UL 5		8.40	1425	206	358	140	58	52	17	244	3.4	177	216	0.23		0.9	0.64				909	5
62768	UL 5		8.20	1425	201	360	140	56	52	18	241	2.1	180	223	0.07		0.8	0.71				916	8
70168	UL 5		8.35	1490	200	364	140	57	54	19	238	2.9	190	227	0.29		0.8	0.70				929	16
70568	UL 5		8.20	1630	204	364	140	55	55	19	244	2.1	192	232	0.23		0.8	0.71				941	9
70868	UL 5		8.40	1510	194	354	140	54	53	19	230	3.2	190	232	0.23		0.6	0.70				923	8
71168	UL 5		8.35	1390	186	348	132	50	54	19	221	2.7	190	230	0.14		1.0	0.65				862	16
71568	UL 5		8.35	1510	195	344	148	49	54	20	232	2.9	196	233			1.0	0.70				937	17
71868	UL 5		8.30	1000	194	346	130	50	54	20	232	2.4	196	234	0.07		1.0	0.73				920	9
72168	UL 5		8.00	1000	184	346	145	36	62	20	222	1.2	200	240	0.07		0.9	0.64				928	14
72568	UL 5		8.00	1450	172	334	130	46	53	20	208	1.1	209	243	0.02		3.5	0.70				842	10
72968	UL 5		7.50	1425	180	348	140	49	55	21	219	0.3	199	241	0.02		2.8	0.74				886	9
80168	UL 5		7.70	1390	174	339	140	47	54	21	211	0.5	202	239			2.6	0.74				840	9
80468	UL 5		7.60	1490	177	354	140	50	56	21	215	0.4	203	245			2.4	0.75				894	5
80868	UL 5		7.65	1490	170	344	140	45	55	21	206	0.5	204	245	0.02		2.4	0.75				884	8
81268	UL 5		8.00	1470	171	340	150	46	55	20	206	1.1	204	241	0.23		2.6	0.77				888	8
81968	UL 5		8.11	1270	170	340	140	45	55	20	205	1.4	207	245	0.50		1.0	0.76				921	5
82668	UL 5		8.00	1425	138	306	155	34	54	22	157	5.5	205	246	0.05		0.4	0.77				856	4
90268	UL 5		8.25	1470	149	342	145	30	60	18	178	1.8	207	241	0.27		0.9	0.80				858	4
90568	UL 5		8.30	1600	165	340	155	43	57	18	199	1.1	217	248	0.27		0.6	0.82				888	4
90968	UL 5		8.45	1450	148	320	150	37	55	18	175	1.8	210	248	0.05		0.3	0.81				878	2
91268	UL 5		8.55	1270	153	329	165	38	57	16	180	3.5	232	249	0.11		0.5	0.58				870	10
91668	UL 5		7.85	1470	160	332	155	40	56	19	194	0.7	221	252	0.23		0.7	0.76				842	10
91968	UL 5		7.95	1500	161	468	165	41	89	19	195	0.9	217	249	0.23		1.0	0.76				906	5
100368	UL 5		7.90	1470	166	380	158	42	67	19	201	0.9	217	255	0.16		0.5					922	29
120368	UL 5		8.30	1560	186	366	165	51	58	19	222	2.5	226	256	0.50		0.9					966	11
51369	UL 5		8.05	1465	211	352	145	59	50	18	254	1.6	184	208	0.32		0.7	0.66				880	30
60369	UL 5		8.45	1390	212	374	140	62	53	17	251	3.9	181	222	0.29		0.8	0.74				880	30
60369	UL 5		8.20	1406									200	218								890	
61969	UL 5		8.20	1395									220	215								892	
62669	UL 5		8.25	1415									210	210								907	
70169	UL 5		8.20	1430									210	215								920	
70869	UL 5		8.20	1345									205	210								860	
71569	UL 5		8.20	1325									210	200								847	
80569	UL 5		7.65	1390	172	323	144	44	52	21	209	0.5	195	220	0.27		0.8	0.70				852	50
90269	UL 5		7.85	1370	157	312	150	36	54	20	190	0.7	204	218	0.07		1.4	0.72				862	21
102169	UL 5		7.85	1300	161	320	140	37	55	19	195	0.8	203	[illegible]	0.25		1.0	0.71				878	45
121669	UL 5		8.25	1280	181	344	150	43	58	18	217	2.1	203	223	0.23		0.1	0.64		1.2		908	13
30370	UL 5		8.25	1390	191	338	145	48	53	18	228	2.2	196		0.23		0.0	0.62				896	35
32470	UL 5		8.30	1170	194	334	130	51	50	18	232	2.6	179	204	0.23		0.0	0.59		1.8		840	38

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
62470	UL 5	23.5	8.40	1370	202	366	145	57	54	20	240	3.3	196	224	0.36		0.1	0.56			8.3	872	10
72270	UL 5	24.5																			9.2		
82670	UL 5		8.30	1335	166	342	170	40	59	31	199	2.2	217	240	0.09		0.2						
92370	UL 5		8.60	1455	168	342	170	40	59	16	197	4.3	237	244	0.09		0.2	0.65					
32572	UL 5	11.5																					
42072	UL 5	11.5		1166	180	327	174	47	51	19	220		190	218	0.19		0.03			00.6		919	
51572	UL 5	18.9		1264	222	377	159	57	57	15	271		191		0.22					00.8		0864	
121669	UL 6																			2.5			
32470	UL 6																		930	3.4			
61570	UL 6	21.5																	75		6.4		
70870	UL 6	27.0	7.95	1230	202	357	135	59	51	20	244	1.2	132	221	0.02		0.6		230		10.1		
81270	UL 6	26.0	8.35	1300	178	340	145	44	56	19	212	2.6	202	225	0.68		0.4				5.0		
90870	UL 6		7.60	1380	181	341	120	56	49	19	221	0.5	150	201	0.97		0.4	0.75					
121669	UL 7																			2.2			
32470	UL 7																		43	4.6			
121669	UL 8																			1.9			
32470	UL 8																		9	2.6			
61570	UL 8	21.0	8.35	1280	209	363	130	63	50	18	249	3.1	180	219	0.72		0.2		93		6.0		
70870	UL 8		8.20	1280	196	355	145	55	53	20	235	2.1	192	225	0.23		0.4		23		10.4		
81270	UL 8	27.0	8.55	1370	170	330	155	40	56	18	200	3.9	207	230	0.23		0.3				4.8		
90370	UL 8		7.70	1200	185	351	150	42	60	21	225	0.6	194	221	0.38		1.4	0.72					
121669	UL 9																			1.4			
32470	UL 9																		9	2.7			
32470	UL10																		9				
61368	UL11		8.30	1490	212	368	140	60	53	18	253	2.8	205	231	0.05		0.9	0.58				964	18
61768	UL11		8.30	1425	210	370	140	61	53	18	251	2.7	180	228	0.27		0.9	0.70				936	6
62468	UL11		8.30	1445	207	360	140	57	53	17	247	2.7	192	225	0.25		0.8	0.67				935	18
62768	UL11		8.30	1445	204	360	140	58	52	19	244	2.7	185	229	0.29		0.8	0.72				932	14
70168	UL11		8.35	1425	195	360	140	55	54	19	232	2.9	187	227	0.29		0.9	0.71				919	14
70568	UL11		8.10	1630	200	360	140	55	55	19	241	1.7	193	232	0.20		0.8	0.72				938	9
70868	UL11		8.30	1530	197	362	150	56	54	19	235	2.6	195	238	0.18		0.9	0.73				951	17
71168	UL11		8.20	1530	196	352	140	51	55	19	235	2.1	190	210	0.16		0.9	0.65				924	15
71568	UL11		8.35	1510	200	352	150	52	54	20	218	2.9	200	234	0.02		0.9	0.68				953	21
71868	UL11		8.40	1390	194	353	140	55	54	20	232	3.2	193	243	0.14		0.9	0.76				939	14
72168	UL11		8.15	1000	187	346	150	37	61	20	225	1.8	195	240			1.3	0.67				932	18
72568	UL11		8.20	1390	183	348	159	51	54	20	219	1.9	204	245			1.3	0.73				956	20
72968	UL11		8.05	1425	183	348	140	50	54	21	221	1.4	200	224	0.16		2.6	0.74				892	10
80168	UL11		7.60	1390	175	339	140	46	54	21	213	0.4	200	241			4.2	0.74				880	10
80468	UL11		7.90	1490	172	346	150	44	54	21	208	1.0	205	246	0.14		8.0	0.74				940	12
80868	UL11		7.90	1530	190	342	140	50	56	21	230	0.9	202	240			2.4	0.73				934	8
81268	UL11		7.55	1210	184	352	150	51	55	21	224	0.4	208	242	0.05		2.7	0.76				955	5
81968	UL11		7.90	1195	169	340	140	45	55	20	204	0.9	209	246	0.32		0.5	0.81				902	6
90568	UL11		8.10	1450	162	334	150	46	55	18	195	1.4	210	246	0.32		0.5	0.83				886	11
90968	UL11		8.35	1450	158	326	170	40	55	16	183	2.3	210	245	0.18		1.0	0.73				930	4
91268	UL11		8.15	1450	157	327	160	38	56	19	169	1.7	211	245	0.14		0.5	0.59				884	13
91668	UL11		7.80	1500	165	332	155	42	55	19	200	0.7	216	248	0.14		0.9	0.78				938	13
91968	UL11		7.95	1450	165	468	150	41	89	19	200	0.9	211	249	0.23		0.7	0.76				962	11
102268	UL11		8.25	1470	177	376	150	51	61	16	212	2.1	208	252	0.36		0.7	0.76				920	29
112668	UL11		8.10	1430	167	348	150	50	54	16	225	1.6	197	230	0.43		0.8	0.67				928	17
42269	UL11		8.20	1370	205	360	130	58	52	2	246	2.2	186	221	0.34		0.8	0.64				899	12

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
52769	UL11		8.35	1285	208	360	130	59	52	17	248	3.0	171	206	0.34		0.7	0.61				883	70
60369	UL11		8.30	1400	213	366	140	61	52	17	255	2.4	179	221	0.32		0.9	0.70				929	8
60369	UL11		8.20	1380									210	217				0.20				883	
61969	UL11		8.18	1370									210	210				0.38				876	
62669	UL11		8.20	1410									218	208				0.41				899	
70169	UL11		8.25										220	210				0.38				892	
70169	UL11		8.30	1315	202	348	130	56	51	19	241	2.7	174	217	0.16		0.9	0.63				840	25
70869	UL11		8.20	1350									220	210				0.38				870	
71569	UL11		8.24	1353									215	210				0.44				866	
80569	UL11		8.05	1400	180	334	145	48	52	22	217	1.3	196	223	0.16		0.9	0.69				868	70
90269	UL11		7.90	1425	165	321	150	39	54	20	200	0.9	204	223	0.09		1.1	0.75				872	50
102169	UL11		8.00	1350	165	328	150	42	54	19	199	1.1	205	228	0.20		1.0	0.65				890	65
112569	UL11		8.10	1335	177	336	150	46	54	19	213	1.5	200	206	0.23		2.5	0.77				880	16
121669	UL11		8.30	1170	183	330	140	48	51	17	219	2.4	185	210	0.23		0.1	0.65				856	10
30370	UL11		8.30	1140	185	350	115	48	56	15	221	2.4	111	177	0.18		0.1	0.56				770	25
32470	UL11		8.40	1170	193	325	115	50	49	17	229	3.2	165	190	0.18		0.1	0.57	3			819	27
62470	UL11	22.5	8.40	1370	207	367	145	58	54	19	245	3.4	197	228	0.36		0.2	0.56	23		7.2	951	26
72270	UL11	23.0																			8.2		
82670	UL11		8.35	1400	166	341	170	41	58	21	198	2.4	222	240	0.09		0.5						
92370	UL11		8.60	1435	167	341	170	38	60	17	195	4.3	226	238	0.09		0.2	0.67					
32572	UL11	11.7																					
40672	UL11	9.4		1199									144		0.13		0.36			00.5		0890	
42072	UL11	9.3		1080	354	324	151	46	51	19	432		180	198	0.12		0.03			00.9		1077	7
51572	UL11	16.9		1253	355	377	153	57	57	14	434		185		0.28		0.10			01.0		0900	
121669	UL12																			1.4			
32470	UL12																		23	2.0			
61368	UL13		8.25	1425	209	358	140	58	52	17	250	2.5	179	218	0.27		0.8	0.66				918	16
61768	UL13		8.40	1445	205	355	140	58	51	17	243	3.4	185	217	0.25		0.9	0.66				916	38
62068	UL13		8.25	1425	204	346	130	57	56	16	244	2.4	170	211	0.18		0.8	0.62				888	11
62468	UL13		8.30	1445	218	368	150	58	54	18	260	2.9	199	234	0.23		0.8	0.68				970	22
62768	UL13		8.35	1445	205	364	160	58	53	19	244	3.0	200	234	0.23		0.8	0.71				973	11
70168	UL13		8.00	1510	203	366	150	58	54	19	245	1.4	197	231	0.02		1.5	0.70				958	13
70568	UL13		8.40	1680	222	364	160	56	54	20	263	3.7	221	234	0.34		0.9	0.73				1014	10
70868	UL13		8.35	1490	193	352	140	54	53	19	230	2.8	190	227	0.18		0.9	0.70				918	9
71168	UL13		8.30	1550	204	350	160	56	54	20	244	2.7	207	238	0.07		0.9	0.67				963	14
71568	UL13		8.20	1510	193	358	154	49	57	20	231	2.0	203	236			0.8	0.69				953	14
71868	UL13		8.45	1390	192	350	150	52	54	20	228	3.2	190	237			0.9	0.75				894	14
72168	UL13		8.15	1425	186	354	190	37	64	20	223	1.7	202	262	0.07		0.9	0.66				1001	14
72568	UL13		8.35	1380	177	340	176	47	54	20	211	2.6	202	240	0.02		1.0	0.72				954	12
72968	UL13		8.10	1425	178	344	140	48	54	21	215	1.5	202	239	0.02		2.7	0.72				896	13
80168	UL13		9.35	1425	177	346	140	47	56	21	211	2.6	201	242			2.2	0.74				890	13
80468	UL13		7.90	1490	174	378	140	50	63	21	210	0.9	202	243			2.1	0.72				906	5
80868	UL13		7.90	1445	175	347	140	48	55	21	212	0.9	208	225			2.4	0.73				913	10
81268	UL13		7.70	1300	174	344	150	45	56	21	212	5.8	205	244	0.09		2.4	0.77				904	6
81968	UL13		7.55	1195	178	346	150	48	55	20	216	0.4	209	241	0.36		0.7	0.77				941	9
82668	UL13		8.20	1500	170	334	145	45	54	21	204	1.8	208	247	0.11		0.2	0.75				894	7
90568	UL13		8.40	1450	165	334	150	42	56	19	198	2.7	214	247	0.11		0.5	0.79				894	7
90968	UL13		7.90	1500	164	340	172	46	55	19	198	0.8	218	251	0.11		1.0	0.59				914	2
91268	UL13		8.35	1450	160	338	162	42	57	19	191	2.4	220	248	0.23		0.8	0.58				896	8
91668	UL13		7.80	1450	163	338	145	41	57	19	198	0.6	216	249	0.36		1.0	0.78				886	8

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	O3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
91968	UL13		8.00	1500	166	340	155	42	57	19	200	1.1	220	252	0.02		0.7	0.77				908	6
100668	UL13		8.40	2000	171	350	160	43	59	18	203	2.8	227	244	0.23		0.6					936	27
120368	UL13		8.45	1510	185	360	166	50	57	18	210	3.4	215	251	0.59		0.7					926	5
60369	UL13		8.00	1320	210	364	140	59	53	17	253	1.4	183	221	0.27		0.8	0.70				884	22
60369	UL13		8.30	1350									200	203								865	
61969	UL13		8.20	1308									216	230								900	
62669	UL13		8.25	1440									220	230								924	
70169	UL13		8.20	1350	195	342	140	53	51	20	234	2.0	187	224			1.0	0.67				860	3
70169	UL13		8.20	1450									224	230								931	
70869	UL13		8.20	1485									220	210								950	
71569	UL13		8.20	1406									222	215								999	
80569	UL13		8.00	1425	183	338	144	48	53	22	221	1.2	201	226	0.05		1.0	0.67				882	52
90269	UL13		7.70	1370	166	348	170	41	60	20	202	0.6	204	227	0.05		1.2	0.77				878	23
100869	UL13		8.40	1350	163	322	161	38	55	19	193	2.7	220	235	0.16		1.6	0.78				894	40
110469	UL13		8.10	1410	176	330	160	42	55	19	212	1.5	212	237	0.18		2.0	0.80				884	22
120269	UL13		8.40	1335	187	350	170	50	55	21	222	3.1	222	211	0.23		1.9	0.83				950	18
40370	UL13		8.30	1300	200	340	160	50	52	18	239	2.6	120	189	0.18		0.2	0.60				880	44
51370	UL13		8.20	1390	212	360	140	60	51	17	254	2.2	184	210	0.32		0.9	0.66				856	30
62470	UL13	24.5	8.40	1370	206	369	145	59	54	20	244	3.4	204	231	0.41		0.3	0.58	39		8.35	910	12
72270	UL13	24.5																			10.4		
82670	UL13		8.40	1350	171	349	175	41	60	21	203	2.8	237	242	0.09		0.2						
92370	UL13		8.60	1435	172	349	170	41	60	17	201	4.4	228	243	0.11		0.1	0.66					
32572	UL13	11.0																					
40672	UL13	10.1		1188		291	139	36	49	14			205		0.13		0.08			02.3		0460	
42072	UL13	11.0		1134	201	314	151	42	51	19	246		190	216	0.16		0.05			01.5		0930	
51572	UL13	19.8		1274	232	377	164	57	57	16	284		205		0.28		0.08			00.4		0851	
100570	UL14		8.20	1280	408	459	125	80	63	12	490	4.3	108	190	1.40		0.6						
61368	UL15		8.20	1555	210	380	160	58	57		251	2.2	210	242	0.18		0.9	0.73				930	12
61768	UL15		8.35	1710	212	389	180	57	60	21	252	3.1	230	254	0.23		1.0	0.70				1059	11
62068	UL15		8.35	1510	214	374	160	57	56	18	255	3.1	203	238	0.23		0.9	0.72				992	27
62468	UL15		8.30	1740	231	400	220	62	60	22	276	3.0	271	275	0.20		0.9	0.76				1191	27
62768	UL15		8.25	1550	234	380	170	58	57	20	244	2.4	225	251	0.20		0.9	0.74				1029	12
70168	UL15		8.50	1655	210	366	170	58	59	21	251	2.4	230	252	0.23		0.8	0.71				1045	23
70568	UL15		8.00	1655	202	364	150	56	54	20	244	1.3	202	237	0.18		0.8	0.70				966	7
70868	UL15		8.35	1630	194	360	150	53	55	20	231	2.9	207	239	0.16		1.0	0.71				908	15
71168	UL15		8.15	1650	204	368	170	54	57	21	245	1.9	224	250	0.09		0.9	0.69				1026	17
71568	UL15		8.20	1550	193	350	156	50	55	20	231	2.0	200	234	0.02		0.9	0.71				890	28
71868	UL15		8.10	1390	194	360	155	51	57	21	233	1.6	214	246	0.05		1.7	0.73				981	17
72168	UL15		8.40	1490	198	362	145	37	66	21	235	3.3	220	254			1.9	0.68				984	20
72568	UL15		7.50	1360	184	364	167	50	58	21	223	0.7	214	249	0.02		1.0	0.75				944	14
72968	UL15		8.00	1510	184	359	150	50	57	22	222	1.2	216	251	0.23		2.7	0.75				922	18
80168	UL15		8.10	1510	186	359	160	50	57	22	224	1.6	220	253	0.02		4.0	0.76				946	8
80468	UL15		7.60	1510	180	366	140	58	59	22	219	0.8	215	253	0.05		2.4	0.76				944	6
80868	UL15		7.90	1510	179	360	150	50	58	22	217	0.4	200	252			2.3	0.75				924	16
81268	UL15		7.95	1605	182	360	180	44	61	22	220	1.1	241	265	0.02		2.4	0.78				986	15
81968	UL15		7.75	1220	173	346	150	46	56	21	210	0.8	220	252	0.41		0.7	0.81				932	12
90268	UL15		7.50	1630	170	362	155	45	61	19	207	0.3	221	248	0.09		0.6	0.82				912	4
90568	UL15		8.55	1550	160	340	155	43	57	19	188	3.7	220	251	0.07		1.0	0.82				896	10
90968	UL15		7.80	1650	163	346	185	41	59	20	193	0.6	240	283	0.45		1.0	0.65				1029	5
91268	UL15		8.20	1470	158	345	180	39	60	20	189	1.7	240	259	0.47		0.5	0.73				948	10

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
91966	UL15		8.00	1500	167	340	170	42	57	19	201	1.1	226	255	0.07		0.7	0.77				918	10
100868	UL15		8.25	1470	172	350	160	43	59	18	206	2.0	227	261	0.20		0.6					934	32
120368	UL15		8.05	1600	203	372	165	54	58	19	241	1.5	229	250	0.54		1.0					966	15
60369	UL15		8.35	1470	214	362	140	61	51	18	255	3.1	182	223	0.32		0.8	0.72				884	27
60369	UL15		8.50	1400									200	199								895	
61969	UL15		8.50	1395									208									892	
62669	UL15		8.35	1418									210	198								904	
70169	UL15		8.00	1450	199	356	150	54	54	24	240	1.3	200	220	0.02		0.9	0.69				908	25
70169	UL15		8.20	1390	189	336	140	51	51	18	226	2.2	180	218			0.9	0.64				844	20
70169	UL15		8.30	1420									212	200								910	
70369	UL15		6.10	4210									680	705								900	
70869	UL15		8.20	1425									210	235								913	
71569	UL15		8.23	1402									212	200								897	
80569	UL15		7.85	1400	175	340	144	45	55	22	212	0.8	197	225	0.27		0.8	0.74				876	50
90269	UL15		7.60	1320	170	337	160	41	57	20	207	0.5	208	232	0.07		1.6	0.91				876	28
100869	UL15		7.70	1375	167	328	168	37	57	19	203	0.6	219	235	0.09		1.5	0.75				916	85
110469	UL15		8.00	1410	191	342	160	44	56	19	231	1.3	225	239	0.27		2.0	0.80				936	51
120269	UL15		8.10	1345	180	342	160	44	56	19	217	1.5	210	234	0.20		1.8	0.75				916	19
30370	UL15		8.30	1550	203	366	190	50	59	22	242	2.7	260	246	0.05		0.1	0.65				1073	3
51370	UL15		8.05	1370	221	364	140	62	51	18	266	1.7	188	213	0.32		0.8	0.68				942	50
62470	UL15	24.5	8.35	1370	207	369	145	59	54	20	246	3.0	200	229	0.41		0.2	0.60	39		7.1	912	32
72270	UL15	24.0																			7.4		
82670	UL15		7.85	1400	170	351	175	40	61	23	206	0.8	220	243	0.11		0.1						
92370	UL15		8.50	1455	179	365	185	44	62	18	212	3.7	249	256	0.20		0.2	0.69					
40672	UL15	11.1		994		252	161	35	40	11			136		0.04		0.08			00.3		0404	
42072	UL15	10.2		1220	195	328	079	44	53	19	239		199	220	0.13		0.04			00.7		853	
51572	UL15	12.1		1285	272	419	171	61	65	16	333		207		0.23		0.11			00.9		0985	
40672	UL16	10.8		1080		194	072	30	29	07			106		0.06		0.07			00.8		0364	
42072	UL16	13.0		1188	201	328	079	44	53	19	246		204	224	0.20		0.03			00.6		0942	
51572	UL16	15.2		1285	212	359	159	50	57	15	259		197		0.24		0.09			01.2		0856	
61570	UL17	19.5	8.30	1300	246	375	135	63	53	18	294	3.2	175	208	0.23		0.2		930	8.5	6.2		
70570	UL17	24.0	8.20	1410	188	370	155	56	56	21	226	2.2	214	232	0.29		0.5		4	7.0	7.8		
80370	UL17	25.0	8.70												0.22		0.12				14.0	932	50
81370	UL17	24.3	8.20	1390													0.03				7.0	1009	50
91270	UL17	24.5	8.45	1435	182	348	165	44	58	20	216	3.3	220	242	0.23		0.2			4.3			
81770	UL17																					996	
90870	UL17		7.20	1410	206	367	170	50	59	21	252	0.2	227	237	0.18		0.5	0.75		8.0			
100370	UL17	18.0	9.70	1567									312		0.04		0.01					910	48
80370	UL19	24.2	8.60																		10.0		28
81070	UL19	25.4	8.35	1365													0.03				8.0	892	65
81770	UL19																					952	
100370	UL19	18.0	9.60	1477									287		0.08		0.02					889	38
61570	UL21	20.5	8.40	980	215	321	95	58	43	11	256	3.6	110	168	0.05		0.2		9	12.0	11.0		
70870	UL21	23.5	8.15	1090	169	299	130	36	51	16	203	1.6	164	201	0.11		0.6		4	12.4	14.0		
81270	UL21	24.5	7.60	1200	158	351	110	32	66	11	192	0.4	200	175	0.20		1.3			18.0	8.7		
90870	UL21		7.60	870	175	257	95	34	42	12	213	0.5	111	160	0.18		0.4	0.55		4.3			
32572	UL21	12.0																					
40672	UL21	13.1				222	064	38	31	06			111		0.04					03.6			
42072	UL21	12.0		907	200	291	049	49	41	11	244		119	160	0.20		0.05			02.2		0790	
51572	UL21	14.0		1145	204	333	150	48	52	13	250		159		0.07		0.07			05.9		672	

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
121669	UL22																			2.0			
32470	UL22																		3	4.8			
61570	UL22	19.5	8.20	1350	210	382	145	64	54	17	252	2.2	203	241	0.36		0.2		93		5.8		
70870	UL22	25.5	8.20	1370	203	369	150	59	54	20	244	2.1	200	232	0.32		0.5		430		7.2		
81270	UL22	25.0	8.00	1500	182	354	160	48	57	24	220	1.2	224	260	0.23		0.4				3.6		
90870	UL22		8.10	1350	177	370	170	51	59	21	213	1.5	223	247	0.18		0.4	0.81					
121669	UL23																			2.3			
32470	UL23																		43	3.5			
61570	UL23	20.5	8.20	1215	211	355	125	63	48	17	254	2.2	174	211	0.61		0.4		1500	8.0	6.4		
70870	UL23	26.5	8.30	1315	193	348	145	52	53	19	231	2.5	193	222	0.14		0.4		9	5.4	9.2		
81270	UL23	27.5	8.45	1335	169	330	155	40	56	20	200	3.1	210	231	0.23		0.2			5.0	4.2		
90870	UL23		7.85	1155	193	346	140	48	55	19	234	0.9	180	210	0.36		0.5	0.69		5.0			
61368	UL24					396	160		61	19		2.7	201	240	0.23		0.9	0.73					
61768	UL24		8.25	1535	205	365	150	56	55	19	245	2.4	200	236	0.25		0.9	0.68				965	9
62068	UL24		8.35	1490	212	364	150	58	53	17	252	3.1	190	229	0.23		0.4	0.68				954	19
62468	UL24		8.30	1445	214	368	150	57	55	18	256	2.8	194	234	0.05		0.9	0.69				966	21
62768	UL24		8.30	1425	202	360	140	58	52	18	241	2.7	188	225	0.02		1.0	0.69				926	7
70168	UL24		8.35	1530	204	364	150	57	54	19	243	3.0	200	235	0.25		0.8	0.70				963	22
70568	UL24		8.25	1680	206	366	150	56	55	20	246	2.4	211	239	0.18		0.9	0.71				981	4
70368	UL24		8.35	1600	196	364	150	54	56	20	233	2.9	204	240	0.16		0.9	0.73				918	9
71168	UL24		8.30	1530	202	382	156	54	60	20	241	2.7	202	221	0.16		0.9	0.67				958	12
71568	UL24		8.35	1580	207	360	142	50	57	20	246	3.0	204	238			0.9	0.70				962	31
71868	UL24		8.25	1390	195	360	155	37	65	20	233	2.3	209	149	0.05		3.0	0.66				912	13
72168	UL24		8.35	1000	186	346	120	36	62	20	221	2.7	[illegible]	242			1.3	0.64				888	13
72568	UL24		8.35	1350	181	324	159	49	49	20	215	2.7	205	244	0.02		1.0	0.73				902	8
72968	UL24		8.05	1390	179	344	140	48	55	21	216	1.3	204	244	0.05		2.1	0.69				900	7
80168	UL24		8.20	1490	183	350	140	50	55	22	220	1.9	208	248			2.4	0.74				912	14
80468	UL24		7.80	1490	175	350	140	46	55	21	212	1.5	208	247			2.3	0.73				894	5
80668	UL24		8.10	1490	179	351	140	49	57	21	216	0.7	205	241	0.02		2.2	0.75				914	16
81268	UL24		7.60	1490	173	342	140	44	56	21	210	0.4	204	242	0.05		3.0	0.71				896	5
81968	UL24		8.65	1240	166	332	140	42	55	21	202	4.8	210	249	0.41		1.0	0.81				894	10
82668	UL24		8.65	1450	152	324	150	39	55	22	177	3.5	213	249	0.05		0.4	0.78				878	8
90268	UL24		8.40	1470	157	332	145	39	57	19	186	2.6	212	242	0.32		0.3	0.79				800	6
90568	UL24		8.50	1425	161	330	155	41	55	18	190	3.3	211	250	0.09		0.5	0.84				886	13
90968	UL24		8.50	1470	163	338	170	41	57	18	192	3.4	214	253	0.16		1.0	0.62				950	5
91268	UL24		7.70	1510	163	356	165	42	61	19	199	0.5	216	247	0.11		0.8	0.58				950	5
91668	UL24		8.10	1500	165	338	155	41	57	19	199	1.4	221	254	0.23		1.0	0.77				949	12
91968	UL24		7.90	1500	162	339	155	41	57	19	196	0.8	222	255	0.09		0.7	0.77				910	5
100868	UL24		8.45	1450	172	344	160	43	58	18	204	3.2	221	254	0.16		0.8					926	32
120368	UL24		8.35	1535	196	366	165	49	59	19	234	2.9	225	248	0.52		0.8					1001	12
60369	UL24		8.25	1470	208	360	145	57	53	18	249	2.4	163	224	0.25		0.8	0.71				938	26
60369	UL24		8.50	1380									224	233								880	
61969	UL24		8.50	1378									220	230								882	
62669	UL24		8.40	1388									220	210								886	
70169	UL24		8.25	1350	188	340	140	50	52	21	225	2.2	193	215	0.05		1.0	0.63				876	18
70169	UL24		8.35	1408									226	212								900	
70869	UL24		8.30	1460									220	200								935	
71569	UL24		8.25	1450									230	210								930	
80569	UL24		7.95	1400	180	340	144	46	55	21	218	1.1	195	223	0.25		1.0	0.69				870	33
90269	UL24		7.63	1335	164	320	150	40	54	20	199	0.4	204	227	0.07		1.3	0.79				868	23

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
100969	UL24		8.45	1375	163	322	155	38	55	19	193	3.0	211	224	0.09		1.6	0.80				908	42
110469	UL24		8.15	1415	180	326	160	41	54	19	216	1.7	212	222	0.18		2.0	0.84				916	6
120269	UL24		8.05	1230	177	334	165	43	55	20	213	1.5	210	233	0.23		1.8	0.81				920	20
30370	UL24		8.30	1390	207	344	155	50	53	18	247	2.7	209	224	0.09		0.4	0.62				918	45
51370	UL24		8.15	1425	210	362	145	61	51	18	252	2.0	193	213	0.20		0.9	0.70				894	35
62470	UL24	23.0	8.35	1300	202	364	140	55	55	20	241	3.0	200	218	0.45		0.2	0.59	75		8.0	904	9
72270	UL24	25.0																			8.9		
82670	UL24		8.35	1370	173	349	175	41	60	21	206	2.5	222	237	0.11		0.2						
92370	UL24		8.50	1455	176	349	180	41	60	16	208	3.6	233	248	0.14		0.1	0.66	9				
32572	UL24	12.0																					
40672	UL24	12.3		1030		225	097	31	36	09			168		0.07		0.08			01.1		0372	
42072	UL24	9.0		1166	191	325	077	48	50	19	234		200	218	0.12		0.04			01.0		0846	
51572	UL24	18.9		1274	228	387	158	61	57	14	279		192		0.26		0.09			00.4		0828	
121669	UL82																			1.0			
32470	UL93																		230	13.0			
42170	UL93																		9300	13.1			
121069	UL94																			4.1			
32470	UL94																		2300				
42170	UL94																		430				
32470	UL95																		5000				
42170	UL95																		230				
121067	UL96																			4.4			
121069	UL97																			1.5			
32470	UL98																		2100				
42170	UL98																		430				
32470	L1 2																		9300	1.0			
42170	L1 2																		2300	1.5			
32470	L1 8																		930				
42170	L1 8																		930				
32470	L111																		230				
42170	L111																		230				
32470	L114																			2.4			
42170	L114																		2300	4.4			
32470	L116																		9300	5.9			
42170	L116																		2300	8.8			
32470	L117																		3000	3.3			
42170	L117																		9300	2.4			

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
61970	PB 1	22.3	6.95																				
62570	PB 1	29.5	8.30																		14.0		430
62670	PB 1																					516	
70270	PB 1	21.5	7.30														4.90		170	1.0		444	10
70970	PB 1	20.0	7.10		191	358	49	94	30	8	234	0.1	42	103			5.0		5000	20.0		565	20
71670	PB 1	26.6	7.70		195	362	34	99	28	7	238	0.5	33	107	2.15		3.9		7500	49.0	5.0	552	25
72370	PB 1	18.7	7.60			205									0.36		1.40		3500	8.0	4.0	482	25
80670	PB 1	23.4	7.55												0.30		1.62		5000	11.0	5.0	472	15
81370	PB 1	23.3	7.90										90		0.13								15
82770	PB 1	21.5	7.50		206	370	35	99	30	7	252	0.3	35	121			1.9			10.0	3.0	591	
90370	PB 1		7.40										63						8000	30.0	5.0	540	20
91070	PB 1	16.5	7.60										50		0.24				3000	7.0		336	
13071	PB 1		7.45		212						259	0.3			0.44	2.08	3.10				4.0	630	
20671	PB 1	4.5		710	210						257				0.45	2.43	3.05				7.0	592	
21371	PB 1	9.0	7.42	740	206						251	0.3			0.43	2.18	2.11				4.0	637	
22371	PB 1	4.0	8.50	680	214						254	3.7			0.22	0.48	2.11					469	
32071	PB 1	8.5	7.40	620											0.45	3.52	4.11					428	
33071	PB 1		7.50	660											2.26	1.86	3.48					510	
41071	PB 1		7.25	670											0.43	1.25	3.29					518	
42971	PB 1		7.35	610											0.41	2.96	3.98					432	
51571	PB 1		7.95	620	212	364	47	98	29	6	259	1.0	34	111	0.34	1.08	2.62						
52171	PB 1		8.35	680											0.38	0.20	1.76						
60771	PB 1		7.52	680													2.82						
62171	PB 1		8.28	640													1.83						
63071	PB 1		8.00	700													2.68						
70571	PB 1		7.60	690													2.16						
72671	PB 1		7.55	680													2.11						
80271	PB 1		7.60	660													1.50						
61970	PB 2	24.5	8.10																			578	58
62570	PB 2	28.5	8.35																		8.0		50
62670	PB 2																					591	
70270	PB 2	21.9	8.65														2.50			17.0	19.0	595	85
70970	PB 2	24.0	7.38																500	25.0		489	45
71670	PB 2	27.5	8.50		159	323	67	70	36	11	195	2.8	60	122	0.05		1.3		1700	28.0	10.0	562	95
72370	PB 2	23.0	7.60			222									0.27		2.60		6000	8.0	3.0	434	20
80670	PB 2	25.6	7.60												0.28		3.70			8.5	2.8	458	25
81370	PB 2	24.6	7.95										75		0.73		3.50				87.0	478	
82770	PB 2	22.0	7.70		205	363	33	96	30	7	251	0.5	100	120			2.7		4000	2.0	4.0	640	15
90370	PB 2	19.0	7.70										63		0.31		2.40		5000	25.0	4.0	523	15
91070	PB 2	16.5	7.60										50						5000	10.0	5.0	487	15
92670	PB 2	16.0	7.90	824									63		0.65		0.80				7.0	494	15
101770	PB 2	14.5	8.10		206	346	31	96	26	6	252	1.4	32	128	0.91		2.7		1000	1.0	5.0	575	
117170	PB 2	9.0	7.30	730	207	392	32	96	37	8	253	0.7	31	145	0.41		3.3		0500	22.0	6.0		24
10971	PB 2		7.80	510	178		24		22		217	0.6	27	79	0.76	3.46	3.28					395	
13071	PB 2		7.60	665	218						265	0.4			0.36	2.67	4.00				4.0	512	
20671	PB 2	3.0	8.15	715	228						275	1.8			0.40	2.06	3.70				11.0	577	
21371	PB 2	4.5	7.80	680	225						273	0.8			0.21	0.68	2.17				14.0	547	
22371	PB 2	4.0	8.50	720	184						219	3.2			0.05	0.28	1.25					477	
32071	PB 2	6.0	7.70	780											0.02	0.43	0.37				6.0	601	
33071	PB 2		7.64	770											1.48	1.00	0.98					571	

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
42971	PB 2		8.38	590										121	0.09	0.69	0.71					432	
41071	PB 2		7.82	720											0.40	0.55	1.30					551	
51571	PB 2		8.20	670	200	356	69	90	32	7	245	1.8	49	121	0.12	0.46	1.12						
52171	PB 2		8.70	690											0.16	0.10	1.34						
60771	PB 2		8.08	700													0.70						
62171	PB 2		8.40														1.03						
63071	PB 2		8.70	670													0.47						
70571	PB 2		8.30	660													2.21						
72671	PB 2		8.40	640													1.67						
80271	PB 2		7.60	630													2.91						
80471	PB 2		7.80	620													3.29						
32572	PB 2	14.5																					
40672	PB 2	14.5		821		269	036	65	26	05			075				0.29			01.4			
42072	PB 2	11.0		616	216	291	045	72	27	06	264		038	111	0.38		1.06			02.2		564	
61970	PB 3	24.3	8.60																				
62570	PB 3	27.5	8.60																		18.0		
62670	PB 3																					597	
70270	PB 3	22.7	8.60														3.50		0	16.0	9.0	560	40
70970	PB 3	23.5	7.80																100	46.0		560	
71670	PB 3	27.6	8.90												0.03		2.85		800	46.0	13.0	460	
72370	PB 3	24.0	8.20												0.21				3000	32.0	9.0	485	
80670	PB 3	25.7	8.15												0.43		4.00		1200	19.5	10.0	449	55
82770	PB 3	24.5	7.60		212	359	35	96	29	8	259	0.4	63	114			3.4			8.0	5.0	607	
90370	PB 3	21.5	7.70										50		0.43		4.60		1800	25.0	7.0	500	25
91070	PB 3	20.0	8.45										63						300	18.0		484	
92470	PB 3	15.0	8.70	751									63		1.40		1.80				13.0	489	20
13071	PB 3		7.60	675	204						248	0.4			0.41	2.22	2.80					488	
20671	PB 3	3.0	8.50	730	238						283	4.2			0.38	2.06	3.35					651	
21371	PB 3	5.0	8.00	730	235						284	1.3			0.06	0.25	1.96				11.0	645	
22371	PB 3	3.0	8.65	700	213						250	5.2			0.29	0.59	2.41					508	
32071	PB 3	6.5	7.75	720											0.20	1.13	1.64				7.0	538	
33071	PB 3		7.68	760											1.59	0.65	1.35					552	
41071	PB 3		7.58	550												0.33	0.42					457	
42971	PB 3		8.65	590										130	0.09	0.15	0.35					416	
51571	PB 3		8.45	690	223	334	67	78	34	7	236	18.0	57	130	0.12	0.18	0.74						
52171	PB 3		8.90	700											0.12	.003	0.46						
60771	PB 3		8.20	650													1.01						
62171	PB 3		8.30														1.58						
63071	PB 3		9.10	650													0.65						
70571	PB 3		8.90	670													0.93						
72671	PB 3		8.75	670													1.44						
80271	PB 3		6.60	800													1.14						
61970	PB 4	24.9	8.40																			489	25
62570	PB 4	28.5	8.70			256															13.0		22
62670	PB 4																					618	
70270	PB 4	22.4	8.45														0.45				11.0	611	35
70970	PB 4				278	299	94	49	43	12	157		80	102	0.09		0.6		25	38.0		628	
71670	PB 4	26.9	8.45		145	276	86	48	38	13	177	2.3	77	143			1.1				11.0	583	100
72370	PB 4	26.5	9.15												0.27		0.88				14.0	557	220
80670	PB 4	26.5	8.65																		11.0		120

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
81370	PB 4	23.6	9.05										125		0.03		1.00				9.0	511	100
82770	PB 4	22.5	8.00		174	309	52	76	29	9	213	1.0	46	113	0.18		2.7		4500	16.0	3.0	541	20
90370	PB 4	23.5											53		0.47				3250	34.0	7.0	508	
91070	PB 4	17.0	7.80										312				2.40		1000	12.0	4.0	468	
92670	PB 4	15.0	8.00	751									53		1.00		2.50				6.0	432	15
101770	PB 4	14.0	8.10		199	346	31	94	27	6	243	1.4	31	133	0.05		1.7				6.0	514	12
112170	PB 4		7.70		209	371	36	96	32	8	255	0.6	32	135	0.07		4.0						
10971	PB 4	0.5	7.90	640	231		31		32		280	1.0	39	103	1.12	3.23	3.50				6.0	522	
13071	PB 4			600	212						259				0.33	2.05	3.30					476	
20571	PB 4			790	239						292				0.33	1.34	2.42					604	
21371	PB 4	5.0	7.80	740	228						277	0.8			0.06	0.25	0.95				12.0	599	
22371	PB 4		8.55	730	174						206	3.4			0.05	0.34	0.87					506	
32071	PB 4		7.95	780											0.07	0.14	0.20					589	
33071	PB 4		7.75	790											1.20	1.21	0.46					593	
41071	PB 4		7.58	790											0.26		0.30					636	
61970	PB 5	26.2	8.50																				
62570	PB 5	29.0	8.85																		14.0		50
62670	PB 5																					623	
70270	PB 5	22.6	8.55														0.44				14.0	620	70
70970	PB 5																					536	
71670	PB 5	28.3	8.90		154	286	82	52	38	12	188	7.0	73	141			1.0				15.0	587	
72370	PB 5	24.5	9.30			171															25.0	507	145
81370	PB 5	25.2																			12.0	504	95
82770	PB 5	23.5	7.95																		4.0	511	50
90370	PB 5	23.5	7.90										50									491	50
91070	PB 5	17.0	7.70										81								3.0		
92670	PB 5	15.0	8.10	761									50				2.18				7.0	438	25
10971	PB 5		7.90		238		29		32		289	1.0	34	107	1.17	1.86	3.00					567	
21371	PB 5		7.95	690	228						277	1.1			0.15	0.58	2.83				11.0	561	
61970	PB 5	25.0	8.50																				30
62570	PB 6	26.8	6.90																				16
62670	PB 6																					574	
70270	PB 6	18.7	8.70				62		11														
70970	PB 6																					585	
71670	PB 6	26.3	9.10		145	267	87	43	39	13	177	10.4	81	157			1.1				7.0		82
72370	PB 6	23.3	9.00																		10.0	608	125
81370	PB 6	24.2	9.15																		11.0	564	
82770	PB 6	21.0	9.10		144	238	86	33	38	13	176	10.4	71	149	0.27		1.2				5.0	582	150
90370	PB 6	21.0	9.10										88								8.0	646	165
91070	PB 6	6.5	8.80										63								13.0	512	85
92670	PB 6	14.0	9.50	730									75		0.08		0.25				10.0	463	65
101770	PB 6	12.0	8.00	649	150	276	39	63	29	7	184	0.8	39	100	0.05		0.4			25.0	17.0	461	22
112170	PB 6	3.0	7.60	649	154	279	55	54	35	9	188	0.3	44	121			1.7		30	22.0	12.0		82
22371	PB 6																					600	
32071	PB 6																				7.0	564	
33071	PB 6		7.78	790											1.14	0.02	0.51					570	
41071	PB 6		7.82	770											0.15	0.18	0.19					586	
42471	PB 6		8.43	630										118	0.09	0.29	0.34					485	
51571	PB 6		8.55	650	202	330	67	78	33	6	210	18.0	64	123	0.10	.016	0.39						
52171	PB 6		8.68	720											0.11	.004	0.15						

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
60771	PB 6		8.20	710													0.14						
62171	PB 6		8.10														0.42						
63071	PB 6		9.40	740													0.25						
70571	PB 6		8.70	700													0.28						
72671	PB 6		9.50	740													0.21						
80271	PB 6		9.40	730													0.20						
90071	PB 6		9.70	710													0.13						
62670	PB 7																					625	
70970	PB 7																					542	
61970	PB 7	25.5	8.50																				24
62570	PB 7	24.8	8.70																		10.0		25
70270	PB 7	20.8	8.58														0.33				11.0	637	35
71670	PB 7	25.0	8.85		144	279	82	46	40	12	176	5.8	76	154	0.00		1.1				8.0	587	90
72370	PB 7	21.0	8.75			171															6.0	503	140
81370	PB 7	23.3	9.05																		10.0	508	125
82770	PB 7	22.0	9.10		152	254	90	41	37	12	186	11.0	73	143	0.16		0.9				6.0	559	145
90370	PB 7	20.0	8.60										100								8.0	529	170
91070	PB 7	16.0	8.70										88								7.0	526	135
92570	PB 7	13.0	9.50	588									100		0.40		0.22				11.0	463	85
101770	PB 7	10.5	7.70		162	225	74	31	36	9	198	0.4	61	130	0.06		0.6				15.0	539	75
112170	PB 7	3.0	8.00		201	317	70	61	40	10	246	1.1	58	149	0.07		1.8		70	22.0	11.0		55
10971	PB 7	0.0	8.10	755	251		49		38		303	1.7	50	163	0.78	0.01	3.60				9.0	607	
22371	PB 7	2.0	8.70	895	199						232	5.4			0.08	0.26	0.31					627	
32071	PB 7	6.5	7.60	850												0.83	0.37				6.0	661	
33071	PB 7		7.90	740											1.51	0.02	0.86					543	
41071	PB 7		7.72	860											0.30	0.46	0.26					665	
42971	PB 7		8.20	860										123	0.08	0.53	0.29					670	
51571	PB 7		8.50	670	177	294	77	65	32	7	214	1.3	56	117	0.08	0.28	0.34						
52171	PB 7		8.70	730											0.11		0.13						
60771	PB 7		7.98	680													0.14						
62171	PB 7		8.00														0.27						
63071	PB 7		9.30	800													0.14						
70571	PB 7		8.80	730													0.38						
72671	PB 7		9.40	650													0.10						
80271	PB 7		9.20	710													0.12						
90071	PB 7		9.70	670													0.16						
61970	PB 8	26.8	8.51																			666	45
62570	PB 8	24.9	8.80																		11.0		25
62670	PB 8																					665	
70270	PB 9	19.2	8.50														0.53				10.0	674	40
70970	PB 8																					581	
72370	PB 8	21.6	8.80			154											0.77			45.0	6.0	492	130
80670	PB 8	26.4	9.10												0.30		1.45		10	46.0	15.0	600	130
81370	PB 8	28.5	9.65														1.45					611	130
81970	PB 8				141	263	82	38	41	13	173		77	152	0.09		0.6		110	58.0			
82770	PB 8	22.0	9.15		146	287	82	54	37	13	179	11.8	83	149	0.16		1.3		20	47.0	6.0	573	165
90370	PB 8	19.0	8.60										113						55	60.0	7.0	572	105
91370	PB 8	15.0	8.95										153		0.13		0.52		0	40.0	7.0	540	75
92670	PB 8	12.5	9.15	730									83		0.58		0.43					464	60
101770	PB 8	11.0	7.90		138	227	54	35	34	8	169	0.6	50	115	0.06		0.7			8.0	16.0	430	55

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
112170	PB 8	3.0	9.05	629									75		0.05		0.52				14.0	464	78
10971	PB 8	0.0	8.10	805	238		63		44		287	1.6	65	154	0.28	1.89	2.60				5.0	676	
10971	PB 8	0.0	8.20	805	234		63		43		282	2.1	75	166	.17		2.60				5.0	769	
22371	PB 8		8.65	1005	198						232	4.8			0.09	0.28	0.13					760	
32071	PB 8	4.0	7.70	830											0.02	0.56	0.36				6.0	624	
33071	PB 8		7.80	780											0.24	1.17	0.55					583	
41071	PB 8		7.82	890											0.39	0.31	0.21					683	
42971	PB 8		8.15	820										131	0.13	0.45	0.21					642	
51571	PB 8		8.40	700	192	311	83	67	35	7	217	9.0	61	124	0.06	0.40	0.47						
52171	PB 8		8.58	710											0.11	0.01	0.13						
60771	PB 8		8.10	720													0.13						
62171	PB 8		8.10														0.24						
63071	PB 8		9.40	730													0.12						
70571	PB 8		9.10	720													0.27						
72671	PB 8		9.70	710													0.22						
80271	PB 8		9.40	700													0.17						
80971	PB 8		9.80	690													0.04						
61970	PB 9	25.2																				627	40
62570	PB 9	28.9	8.00																		13.0		50
62670	PB 9																					648	
70270	PB 9	24.2	8.70														0.54				14.0	633	35
70970	PB 9		8.40																			579	
71570	PB 9	28.2	9.05		131	247	87	33	40	13	161	8.4	88	164	0.00		0.8				13.0	587	90
72370	PB 9	24.5	9.25			154															13.0	561	110
81370	PB 9	30.4	9.75										150								14.0	505	135
82770	PB 9	23.0	9.05		136	196	87	26	32	13	166	8.7	87	151	0.00		1.0				10.0	538	165
90370	PB 9	24.5	9.50										124								8.0	548	130
91070	PB 9	15.0	9.00										88								7.0	506	100
92670	PB 9	16.0	9.50	659									75		0.60		0.36				12.0	462	45
101770	PB 9	12.0	7.10		118	224	62	32	35	8	144		59	118	0.06		0.1				14.0	458	105
112170	PB 9	3.0	7.70		164	294	44	60	35	9	201	0.4	44	135	0.09		1.0		10	27.0	18.0		78
10971	PB 9	0.5	8.20	805	225		68		45		271	2.0	74	166	0.08	0.82	2.00				5.0	730	
22371	PB 9	1.0																				565	
32071	PB 9	5.5	7.90	770											0.02	0.35	0.30					583	
33071	PB 9		7.82	790											0.84	0.01	0.59					596	
41071	PB 9		7.70	830											0.23	0.11	0.29					636	
42971	PB 9		8.10	750										133	0.09	0.55	0.28					534	
51571	PB 9		8.45	720	198					7	216	13.0	66	133	0.09	0.30	0.66						
52171	PB 9		8.60	700											0.10	.001	0.17						
60771	PB 9		8.22	740													0.06						
62171	PB 9		8.20														0.13						
63071	PB 9		9.15	680													0.15						
70571	PB 9		9.10	710													0.06						
72671	PB 9		9.70	720													0.25						
80271	PB 9		9.30	730													0.09						
80971	PB 9		9.85	700													0.17						
61970	PB10	24.7	8.40																			736	44
62570	PB10	24.6	8.60	1400		256															8.0		30
62670	PB10																					808	
70270	PB10	20.1	8.30														0.36			4.0	8.0	869	25

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
70970	PB10		0.		123	330	139	45	53	19	151		161	170	0.41		0.4		25	19.0		763	
71670	PB10	24.0	8.90		146	316	112	54	44	17	179	6.6	133	193	0.00		0.9			18.0	9.0	617	82
72370	PB10	21.7	8.40			154									0.31		0.26		10	22.0	6.0	758	135
80670	PB10	24.0	8.80												0.24		0.45			25.0	10.0	677	155
81370	PB10	23.1	8.70										225		0.12		0.53				8.0	731	115
82770	PB10	21.5	9.15		140	285	110	50	39	14	171	11.3	88	149	0.00		1.9		20	37.0	5.0	1139	135
90370	PB10	23.0	9.25										168								10.0	614	150
91070	PB10	15.5	9.00										150							33.0	8.0	943	113
92670	PB10	12.0	9.20	884									137		0.17		0.70				15.0	897	80
101770	PB10	10.0	7.40	872	129	251	80	28	44	6	158	0.1	93	150	0.05		0.4		10	10.0	10.0	1003	95
112170	PB10	3.0	7.80	864	147	295	102	44	45	15	180	0.5	114	169	0.07		0.4			20.0	10.0		53
121270	PB10	1.0	8.85	944	170		178		45	9	208	6.9	88	179	0.10		1.0			12.0			75
10971	PB10		8.30	825	215		82		49		258	2.4	87	182	0.10	0.83	2.00				6.0	750	
22371	PB10	1.5	8.60	800	189						223	4.1			0.11	0.42	0.23						
22771	PB10		8.10	925	189						228	1.3			0.11	0.09							
32071	PB10		7.85	1025											0.09	0.52	0.28					573	
33071	PB10		7.86	940											0.43	0.49	0.27				6.0	765	
41071	PB10		7.92	1195											0.29		0.09					714	
42971	PB10		8.10	900										148	0.07	0.60	0.20					748	
51571	PB10		8.45	770	178	345	103	74	39	9	214	1.8	85	147	0.08	0.22	0.09					654	
52171	PB10		8.35	1045											0.33	0.02	0.13						
60771	PB10		8.23	940													0.09						
62171	PB10		8.60														0.21						
63071	PB10		9.20	830													0.12						
70571	PB10		8.90	920													0.26						
72671	PB10		9.55	830													0.11						
80271	PB10		9.30	870													0.15						
80971	PB10		9.65	830													0.12						
61970	PB11	26.3	8.20																			885	65
62570	PB11	24.5	8.31	1400																	7.0		25
62670	PB11																					928	
70270	PB11	19.4	8.20	3500													0.14				6.0	871	60
70970	PB11		0.																			886	
71070	PB11	22.7	8.35																			886	50
71670	PB11	24.0	8.20		167	370	145	61	53	22	204	1.5	209	242			0.1				7.0	894	65
72370	PB11	21.7	7.95			171									0.31		0.04				7.0	905	93
80670	PB11	23.5	8.20												0.26		0.07				6.0	906	40
81370	PB11	23.3	8.50										338								9.0	873	50
82770	PB11	23.0	8.60		152	351	175	45	58	27	186	3.4	400	248	0.10		0.23			9.0	6.0	914	70
90370	PB11	23.0	8.65										300							65.0	9.0	976	70
91070	PB11	15.0	8.55										288							20.0	7.0	838	70
92670	PB11	12.5	8.50	1447											0.22		0.05				11.0	887	65
101770	PB11	10.0	8.40	1407	152	345	145	46	56	21	186	2.1	325	224	0.06		0.05			10.0	11.0	872	75
112170	PB11	3.5	0.45	1206	161	361	146	49	58	23	197	2.6	177	216	0.22		0.8				10.0		43
121270	PB11	2.0	8.45	1145	185		219		60	16	226	2.9	185	219	0.11		0.4						68
22371	PB11	1.5	8.48	1055	181						215	3.0			0.15	0.24	0.60						
22771	PB11		8.00	945	168						204	0.9			0.42	0.22	0.25					751	
32071	PB11	3.5	8.05	1015											0.15	0.38	0.23				8.0	743	
33071	PB11		8.15	1025											0.57	0.19	0.17					780	
41071	PB11		8.13	1105											0.34		0.07					831	

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
42971	PB11		8.35	1085											0.35	0.15	0.13					820	
51571	PB11		8.50	1075	190	392	145	68	54	16	214	9.0	173	205	0.28	0.11	0.13						
52171	PB11		8.38	1055											0.33	0.01	0.15						
60771	PB11		8.31	1205													0.13						
62171	PB11		8.40														0.24						
63071	PB11		8.70	1135													0.10						
70571	PB11		8.55	1055													0.17						
72671	PB11		8.60	1245													0.13						
80271	PB11		8.70	1205													0.14						
80971	PB11		9.00	1115													0.14						
101770	PB45																					459	
112170	PB45	8.5	7.40	751	209	371	36	96	32	8	255	0.3	32	135	0.07		3.95				5.0	571	22
13071	PB45		7.60	844											0.34		4.40				5.0	476	
20671	PB45	3.0	8.30												2.90		0.32				12.0	604	
22371	PB45	3.0																				506	
32071	PB45	6.0																			6.0	589	
33071	PB45																					593	
42971	PB45		8.50	580										130	0.08	0.31	0.32					421	
51571	PB45		8.30	720	200	359	80	86	35	7	245	2.2	62	127	0.11	0.34	0.64						
52171	PB45		8.80	720											0.13	.002	0.37						
60771	PB45		7.98	670													0.12						
62171	PB45		8.00														0.15						
63071	PB45		8.30	610													0.21						
70571	PB45		8.50	650													0.61						
72671	PB45		9.40	710													0.10						
80271	PB45		8.20	740													0.18						
80971	PB45		7.85	640													2.45						

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
62270	GB 1	24.7	8.40																			3265	73
63070	GB 1	20.4	8.70	2800													0.17		70	6.0	8.0	2650	55
70670	GB 1	25.9	8.60														0.21			6.0	7.0	2875	70
71370	GB 1	24.4	8.90		209	758	658	78	137	40	256	9.5	938	631	0.10		0.04			7.0	7.0	2860	92
72070	GB 1	26.0	8.95		193	665	645	57	127	40	236	9.8	999	672			0.1		45	12.0		3023	85
72770	GB 1	23.6	9.00														0.23				8.0	3333	
80370	GB 1	24.8	8.80														0.31		31	14.5	5.0	3512	110
81070	GB 1	23.4	8.40														0.09			35.0	5.0	3748	
62270	GB 2	24.7	8.40																			2260	86
63070	GB 2	19.7	8.60	2800													0.14		50	4.5	8.0	1965	55
70670	GB 2	25.3	8.60																		8.0	2009	60
71370	GB 2	24.4	8.75			222									0.07		0.17				7.0	2155	80
72070	GB 2	26.1	8.65		194	531	419	61	92	36	225	11.0	651	475			0.02				9.0	2011	80
72770	GB 2	23.3	8.90																		8.0	2434	45
80370	GB 2	24.5	8.00																				73
81070	GB 2	22.8	8.55	4440											0.20		0.08				8.	2269	55
62270	GB 3	24.0	8.20																			968	50
63070	GB 3	20.5	8.45	3500													0.15			5.5	7.0	1348	55
70670	GB 3	24.2	8.43														0.15		20	0.0		1295	55
71370	GB 3	24.0	8.60			137									0.11		0.07			9.0	7.0	1299	35
72070	GB 1	26.0	8.45		168	382	216	56	59	26	205	2.7	306	296			0.04		55	11.0	8.0	1211	75
72770	GB 3	23.9	8.50																		6.0	1335	100
80370	GB 3	24.4	8.65																30	19.0	8.0		75
81070	GB 3	23.5	8.20	2100									590				0.02			7.0	7.0	1387	70
81770	GB 3	24.2	8.60		175	639	.61	55	122	29	214	4.0	375	332	0.02		0.6			8.0	7.0	1496	45
82470	GB 3	23.5	8.60										175		0.05		0.60			1.0	6.0		95
83170	GB 3	23.5	8.45										400						10	19.0	7.0	1341	170
100370	GB 3	15.5	9.85	2101									500		0.45		0.02					1305	40
103170	GB 3	6.5	8.20	2158	194	499	421	50	91	40	237	1.7	479	396	0.05		0.28			16.0	5.0		25
120570	GB 3	2.5	8.55	2005	185	497	384	64	82	34	226	3.7	478	368	0.04		0.65			0.4			24
40672	GB 3	12.0		1490		355	206	40	62	19			157		0.03		0.07			01.5		0642	
42072	GB 3	10.3		2376	246	460	384	54	79	30	301		492	405	0.38		0.03			00.6		1745	
51572	GB 3	15.0		3240	306	734	522	80	130	40	374		803		0.09		0.08			03.1		2446	
62270	GB 4	23.7	8.20																			1231	60
63070	GB 4	18.7	8.30	4000													0.14				7.0	1114	85
70670	GB 4	23.7	8.42														0.12				7.0	1086	90
71370	GB 4	24.5	8.55			222									0.10		0.06				7.0	1206	65
72070	GB 4	24.4	8.45		178	391	209	56	61	26	181	18.0	314	299			0.4				7.0	1291	85
72770	GB 4	23.6	8.50																			740	
81070	GB 4	23.6	8.15	1470													0.02				8.0	950	135
81770	GB 4				172	581	238	53	109	25	211		296	282	0.11		0.3					1148	
82470	GB 4	24.0	8.60										125						20	7.0			85
83170	GB 4	23.5	8.75										999							11.0	7.0	1065	115
100370	GB 4	15.0	9.65	1768									437		0.45		0.01					1091	45
103170	GB 4	6.5	8.75	2000	166	519	312	48	97	31	203	5.3	293	280	0.04						10.0		14
120570	GB 4	2.5	8.20	1949	173	457	209	61	74	27	212	1.5	383	162	0.07		0.05		10	11.0	9.0	1125	722
62270	GB 5	22.7	8.15																			984	50
63070	GB 5	20.0	8.20														0.13		75	2.5	7.0	972	80
70670	GB 5	23.9	8.39																		7.0	1007	65
71370	GB 5	24.3	8.50			188									0.11		0.05				8.0	1051	53

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
72370	GB 5	25.0	8.50		150	339	174	47	54	24	184	2.7	253	267			0.2				11.0	1294	75
72770	GB 5	24.1	8.70																		11.0	686	95
81770	GB 5				158	530	212	51	98	22	193		226	253			0.6					1041	
62270	GB 6	23.8	8.10																			1298	43
63070	GB 6	20.6	8.30														0.12				7.0	1000	85
70670	GB 6	26.2	8.35																		6.0	1011	70
71370	GB 6	24.8	8.45												0.04		0.07				7.0	997	50
72070	GB 6	25.9	7.40		159	325	166	43	53	24	194	0.2	242	263			0.4				10.0	1071	87
72770	GB 6	23.5	8.60																		7.0	893	110
81070	GB 6	22.5	8.10	1650													0.02				6.0		105
81770	GB 6		7.90		146	485	169	46	90	21	179	0.6	240	251	0.02		0.8					980	
82470	GB 6	23.5	8.65										100								7.0	980	45
100370	GB 6	15.0	9.15	1728									400				0.12					1032	45
103170	GB 6	6.08	7.80	1708	165	392	204	50	65	29	202	0.5	244	260	0.06		0.5				6.0		28
63070	GB 7	20.3	8.20														0.11				7.0	989	75
70670	GB 7	25.5	8.20														0.12			3.5	7.0	994	70
71370	GB 7	24.5	8.10		171	415	210	61	64	24	209	1.2	248	268			0.02			5.0	7.0	1030	65
72070	GB 7	25.2	7.70		149	347	149	42	59	23	182	0.4	220	251			0.2			7.0	8.0	1045	75
72770	GB 7	22.5	8.20			171											0.04		10	6.0	9.0	881	65
80370	GB 7	24.6	8.40												0.18		0.08		9	9.0	9.0	907	60
81070	GB 7	23.2	8.10	1390											0.20		0.12			8.0	6.0	928	120
81770	GB 7	24.5	7.70		151	501	193	46	94	22	185	0.4	203	248	0.01		0.4			13.0	6.0	967	95
82470	GB 7	23.5	8.45										87		0.06		0.30			3.0	7.0		75
83170	GB 7	23.5	8.50										300							9.0	7.0	907	95
103170	GB 7	5.5	8.10	1467	159	379	189	48	63	28	194	1.1	230	252	0.19		0.15			17.0	9.0		47
81770	GB12	24.5	8.65		234	983	743	66	199	44	286	6.0	997	665	0.07		0.9		20	6.0	4.0	2995	120
82470	GB12	23.5	8.70										375		0.06		1.50		300	12.0	6.0		100
83170	GB12	24.0	8.75										999						10	26.0	6.0	2683	115
100370	GB12	16.0	9.95	4202									999		0.36		0.02					2497	95
103170	GB12	7.0	8.40	4252	257	755	899	62	146	58	296	9.0	965	660	0.07		0.3		0	17.0	9.0		45
120570	GB12	2.5	8.30	3342	227	653	723	82	109	50	278	2.6	922	558	0.09		0.34		20	11.0			24

SUPPLEMENTAL DATA FROM U.S. BUREAU OF RECLAMATION - SEPTEMBER 1972 THROUGH JUNE 1973

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
91472	UT 9	35	18.3	8.4	682			19	76	38	3	318	8.4	18	103	1.31							431	
103172	UT 9	30	10.0	8.0	632			17	66	36	3	279		17	84	2.19							398	
112972	UT 9	25	4.4	7.9	675			19	74	37	3	309		17	92	1.56							398	
10273	UT 9	22	4.4	8.1	712			20	82	37	3	337		21	98	1.94							448	
20273	UT 9	29	5.6	8.0	730			22	77	39	3	321		21	93	1.94		0.02					443	
22773	UT 9	33	8.9	8.2	782			26	80	43	5	331		25	117	1.81		0.02					490	
32273	UT 9	33	10.0	8.1	723			23	71	40	4	318		23	108	1.58							461	
41773	UT 9	31	14.4	8.2	697			23	72	38	3	310		20	97	1.63							444	
51473	UT 9	25	15.6	8.1	657			22	61	37	4	284		20	96	1.15							402	
91472	UT18	35	18.3	8.3	799			27	92	39	5	370	8.7	27	94	2.21		0.02					514	
103172	UT18	40	11.1	8.0	756			27	76	38	5	375		27	103	2.71		0.23					516	
112972	UT18	34	6.7	8.0	818			30	99	40	5	383		29	102	2.71		0.27					508	
10273	UT18	27	5.6	8.1	889			36	98	41	5	392		37	112	3.39		0.38					552	
20273	UT18	25	6.7	8.2	897			40	94	42	6	375		40	136	3.44		0.34					559	
22773	UT18	30	10.0	8.1	1030			53	98	48	7	396		51	154	2.94		0.30					587	
32273	UT18	37	10.0	8.0	1050			57	98	50	9	399		61	167	2.89		0.30					678	
41773	UT18	27	11.1	8.2	910			44	91	41	7	362		44	132	4.52		1.14					596	
51473	UT18	10	16.7	8.0	759			33	78	35	6	325		34	96	1.76		0.30					466	
91472	UT34	8	15.6	7.9	689			14	86	20	5	315		18	61	0.75		0.04					371	
103172	UT34	4	7.8	8.0	629			15	91	21	5	314		20	61	0.75		0.08					389	
112972	UT34	4	11.7	8.2	592			15	85	21	5	300		18	56	0.88		0.04					351	
10273	UT34	3	6.7	8.0	631			15	90	21	5	320		19	57	0.77		0.04					379	
20273	UT34	3	4.4	7.9	631			15	86	21	5	330		22	57	0.68		0.04					368	
22773	UT34	4	11.1	8.0	645			17	85	22	5	300		24	77	0.61		0.04					377	
32273	UT34	6	10.0	7.9	636			15	88	22	5	299		25	71	0.81		0.02					387	
41773	UT34	9	13.3	7.8	637			16	87	21	4	249		25	62	0.86		0.04					404	
51473	UT34	14	13.3	7.9	636			15	88	21	4	296		23	65	1.63		0.02					394	
91472	UT38	10	17.8	8.3	584			11	70	19	3	245	9.	13	52	0.99		0.11					315	
103172	UT38	20	12.2	8.1	537			12	75	19	3	262		15	51	0.99		0.04					330	
112972	UT38	8	13.3	8.4	778			41	[illegible]	29	5	323	8.7	59	57	2.26		0.15					469	
10273	UT38	22	5.6	8.2	525			12	74	19	3	256		15	56	0.95		0.04					318	
20273	UT38	22	6.7	7.8	528			13	69	19	3	243		17	61	0.97		0.08					302	
22773	UT38	20	12.2	8.2	559			14	74	20	3	260		17	62	1.04		0.04					330	
32273	UT38	20	10.0	8.2	553			14	72	19	3	246		17	61	0.90		0.11					345	
41773	UT38	24	13.3	7.8	434			13	56	14	3	188		17	44	0.68		0.19					272	
51473	UT38	10	15.6	7.8	615			17	79	23	5	296		21	61	1.42		0.19					367	
91472	UT41	9	18.3	8.1	575			14	75	23	3	303		15	54	0.58		0.04					348	
103172	UT41	5	15.6	8.1	555			19	58	27	4	259		18	62	0.18							336	
112972	UT41	4	7.8	8.1	573			21	59	29	3	274		19	59	0.86							325	
10273	UT41	4	2.2	8.2	662			22	81	31	3	350		21	57	1.13		0.02					392	
20273	UT41	3	4.4	8.0	656			23	73	29	3	317		23	56	1.17		0.02					368	
22773	UT41	4	7.8	8.1	728			27	78	32	4	359		24	63	0.79		0.04					415	
32273	UT41	6	8.9	8.3	697			28	74	34	4	303	17.7	32	79	0.81		0.04					429	
41773	UT41	6	11.1	8.1	659			23	74	31	3	337		20	54	0.79		0.02					404	
51473	UT41	9	15.6	8.1	666			22	79	30	4	337		23	67	0.77		0.04					485	
91472	UT42	12	18.9	7.7	968			31	122	38	5	271		40	248	0.36		0.02					604	
103172	UT42	18	15.6	7.7	1010			33	132	41	7	278		40	267	0.68		0.04					729	
112972	UT42	28	12.2	8.1	1010			33	132	40	6	276		42	265	0.79		0.08					699	
10273	UT42	18	8.9	7.5	1090			37	139	45	6	292		47	307	0.68		0.02					777	
20273	UT42	8	4.4	8.1	1070			40	131	42	6	269		49	290	0.95		0.04					748	

DATE	STA	FLOW	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DO	DS	TURB
22773	UT42	9	6.7	7.6	1130			43	134	45	7	279		49	321	0.50		0.02					798	
32273	UT42	28	11.1	7.7	1150			46	138	47	8	270		53	334	0.50		0.04					844	
41773	UT42	10	14.4	7.5	1090			43	132	43	7	273		48	309	0.43		0.02					789	
51473	UT42	22	16.1	7.7	1060			37	133	41	6	278		48	294	0.21		0.08					745	
91472	UT43	9	18.3	8.1	939			41	90	44	6	361		53	163	0.34		1.14					632	
103172	UT43	10	12.0	8.2	899			36	112	35	5	310		59	180	1.33		1.14					608	
112772	UT43	8	10.6	8.1	845			32	107	33	5	307		42	143	2.94		0.76					550	
10273	UT43	2	5.6	7.5	824			30	100	31	5	297		40	132	3.44		1.14					529	
20273	UT43	3	3.3	7.5	880			38	100	32	4	286		52	159	2.17		1.14					558	
22773	UT43	3	8.9	8.0	943			39	106	37	5	310		49	186	0.84		1.14					608	
32273	UT43	6	7.8	7.9	973			40	112	40	6	302		54	213	0.86		0.76					660	
41773	UT43	7	11.1	8.0	896			34	107	35	5	291		45	194	0.90		0.76					605	
51473	UT43	7	15.6	7.7	810			36	92	28	8	296		47	132	2.42		1.90					514	
103172	UT44	27	10.0	8.1	508			10	73	18	2	260		11	42	0.84		0.00					310	
112972	UT44	24	7.8	8.2	490			12	68	17	2	242		16	51	0.65		0.00					292	
10273	UT44	22		7.9	491			9	78	17	2	251		11	46	0.44		0.00					290	
20273	UT44	29	3.3	8.0	476			9	66	17	2	235		11	51	0.75		0.00					270	
22773	UT44	31	7.8	8.2	521			10	74	18	2	264		13	53	0.79		0.04					300	
32273	UT44	32	7.2	8.3	474			9	78	16	2	229		11	46	0.78		0.00					299	
41773	UT44	53	7.8	8.1	340			6	52	9	2	163		8	33	0.72		0.02					216	
51473	UT44	130	8.9	7.8	253			4	38	6	2	126		6	17	0.45		0.04					155	
103072	UT47	10	11.1	8.1	1300			143	87	51	14	525		105	161	1.94		0.76					851	
112972	UT47	18	7.8	7.9	1400			153	86	50	13	525		115	161	4.52		1.14					873	
10273	UT47	18	2.2	8.1	1500			169	86	54	13	567		126	182	3.61		0.76					937	
20273	UT47	18	3.3	8.5	1450			173	83	50	13	438	41.7	129	163	3.61		1.14					849	
22773	UT47	20	7.2	8.2	1590			213	75	49	13	537	-	144	200	1.90		1.14					972	
32273	UT47	20	7.8	8.3	1770			237	80	54	14	523	29.4	169	254	2.10		0.76					1100	
41773	UT47	18	10.0	8.6	2280			398	82	40	14	553	62.1	234	357	1.83		1.14					1500	
51473	UT47	20	13.3	7.8	1180			147	63	35	14	393		114	144	1.49		1.14					729	
91472	UT51	6	21.1	8.4	1390			135	82	58	13	464	21.0	125	167	0.54		0.11					884	
103172	UT51	42	5.6	8.1	1310			113	85	65	15	520		96	179	1.11		0.30					845	
112972	UT51	43	3.9	8.1	1340			117	88	67	14	539		93	169	1.51		0.23					849	
10273	UT51	47	0.0	8.0	1340			110	91	67	14	570		85	165	1.96		0.38					843	
20273	UT51	42	0.0	8.2	1220			99	86	61	11	498		83	163	1.96		0.34					760	
22773	UT51	70	5.6	8.2	1470			155	70	70	16	514		123	209	0.65		0.15					937	
32273	UT51	47	8.9	8.2	1640			160	88	79	14	514		155	261	1.35		0.19					1050	
41773	UT51	46	10.0	8.2	1190			112	81	55	10	436		95	167	0.79		0.19					772	
51473	UT51	71	13.3	7.9	600			37	54	24	5	248		34	67	0.27		0.04					378	

DATE	STA	TEMP	PH	COND	AL	HARD	NA	CA	MG	K	HCO3	CO3	CL	SO4	NO3	NH3	PO4	F	COLF	BOD	DD	DS	TURB
82172	UL 1	21.7	8.3	1570			182	50	60	19	204	11.1	233	284	0.27		0.02					965	
82172	UL 2		8.1	1550			178	47	59	19	224		225	265	0.45		0.04					943	
82172	UL 3	20.6	8.3	1560			184	47	60	19	192	16.3	228	280	0.09		0.02					971	
81172	UL 5	18.3	8.3	1550			180	42	59	20	206	2.4	227	269	0.68							954	
82172	UL 5	22.2	8.1	1540			182	46	59	19	219		227	265	0.47		0.04					960	
102472	UL 5	10.6	7.9	1510			173	49	58	19	215		220	265	0.25		0.04					945	
111472	UL 5	5.6	8.1	1450			161	52	55	17	223		202	244	0.18		0.04					907	
82172	UL 6	23.9	7.9	1580			185	46	60	19	222		232	282	0.93		0.04					958	
91172	UL11	17.2	8.6	1590			186	43	61	20	190	9.9	239	282	0.14		0.02					966	
102572	UL11	10.0	8.0	1520			170	54	58	19	226		214	255	0.38		0.04					945	
111472	UL11	5.6	8.0	1400			152	59	56	16	242		198	246	0.77		0.08					874	
82172	UL12	21.7	8.1	1580			184	49	60	19	228		233	275	0.43		0.04					982	
81172	UL13	18.9	8.6	1610			192	45	61	22	183	14.7	243	276	0.07							990	
102572	UL13	9.4	8.3	1610			188	49	61	20	190	12.3	237	282	0.16							1020	
91172	UL15	18.9	8.7	1590			187	42	60	20	171	17.4	237	280	0.07							974	
82172	UL16	21.1	8.2	1680			204	53	61	20	239		262	282	0.23		0.02					1020	
91172	UL16	18.9	8.6	1600			188	45	60	20	165	14.4	241	276	0.09		0.00					986	
102572	UL16	10.0	8.1	1680			195	50	62	22	220		257	276	0.29		0.04					1050	
82172	UL17	22.2	8.2	1650			196	50	61	20	239		242	280	0.45		0.04					1000	
102472	UL19	10.6	8.0	1590			182	51	61	20	221		229	276	0.29		0.04					988	
111472	UL19	5.0	7.9	1440			161	54	59	17	231		207	246	0.43		0.04					883	
111472	UL19	4.4	8.0	1410			159	53	57	17	231		203	246	0.25							884	
91172	UL24	17.8	8.7	1570			189	42	61	20	172	16.2	239	276	0.05							972	
102572	UL24	10.0	8.0	1580			179	50	60	20	219		230	276	0.32		0.04					980	
111472	UL24	5.0	8.2	1450			162	54	57	16	231		206	246	0.61		0.02					886	
82172	PA 1	21.7	7.9	868			76	53	36	9	228		85	162	2.21		0.30					554	
82172	PA 3		8.3	987			97	32	40	11	167	5.1	106	184	1.87		0.04					582	
81172	PA 4	16.1	8.0	1060			109	49	46	11	341		91	161	0.87		0.08					645	
102572	PA 4	8.9	7.5	792			48	72	35	7	300		49	106	2.17		1.14					523	
82172	PA 5	21.7	8.3	1560			184	47	59	19	203	14.4	228	269	0.34		0.04					955	
81172	PB 8	18.3	8.9	865			84	33	42	11	190	2.4	95	154	0.11							552	
91172	PA10	17.8	8.8	1130			127	34	49	13	179	10.5	146	213	0.09		0.02					708	
91172	PB11	18.9	8.6	1600			188	45	61	20	187	14.1	243	282	0.07							998	
102572	PB11	8.9	7.7	1540			175	52	58	19	228		221	259	0.20		0.04					955	
82172	GB 1	21.1	8.2	1590			186	48	59	19	197		235	269	0.09		0.02					979	
82172	GB 2	20.0	8.4	1680			202	45	64	20	196	10.2	260	296	0.47		0.02					1030	
82172	GB 3	21.7	8.0	1620			188	46	61	20	221		240	282	0.50		0.04					940	
91172	GB 3	17.2	8.7	1700			219	30	66	23	142	20.1	277	290	0.14							1020	
102572	GA 3	10.6	7.9	1600			186	48	61	20	220		237	302	0.20		0.02					987	
111472	GB 3	5.0	8.1	1470			167	52	56	17	193		207	250	0.18		0.04					915	

SECTION XIII

APPENDIX B - LKSIM - WATER QUALITY SIMULATION MODEL FOR SHALLOW LAKES

DESCRIPTION

The purpose of the following paragraphs is to give a general description of the simulation model LKSIM and to indicate the general application, capability, and data requirements of the model.

Need For The Model

When modifications of tributary inflows, either rate or quality, or lake geometry are considered, a very relevant concern is the impact on lake-water quality. For most lake systems, the large quantities of data to be incorporated, as well as the tedious and time-consuming calculations to be completed, make a computer-based computational system attractive. One of the main advantages of a computer-based system is that numerous lake system modifications may be readily and economically evaluated.

Conceptual Model - LKSIM

Various types of models might be used in water quality modelling, e.g., one, two, or three dimensional models. Also, various water quality parameters might be modelled, e.g., conservative, non-conservative, or biological parameters. The type of model selected depends on many factors, including the simulation time frame, types of data required, types of data available, use of the model, quality parameters of importance.

The LKSIM model was developed to calculate the water balance and conservative salt concentrations in a well-mixed lake system both for existing and diked lake configurations.

The conceptual lake system consists of a main lake that has separable bays or sub-areas connected to it. During each time step in the model (normally one month), it is assumed that each bay is completely separated from the main lake. For each time period, the tributary inflows and outflows (including groundwater) and their salt concentrations, evaporation and precipitation are used to calculate the end-of-period water volume and well-mixed salt concentrations for each sub-area. The imaginary gates isolating the sub-areas from the main lake are then opened. The volume of water required to achieve equilibrium flows across the boundaries, either in or out of each sub-area, is completely mixed in the recipient area. Circulation between the main lake and a bay is simulated by specifying the fraction of the end-of-period volume in the bay that is to be exchanged with lake water. This intermixing, if any, occurs at the end of the period after overall lake stage equilibrium has been achieved.

Any or all of the subareas may be diked off from the main lake. The diked area is carried along in the simulation as a separate lake. Any or all of the tributaries to the diked area may be reassigned to flow into the main lake or into another bay. Any main lake overflow that occurs when a specified maximum lake stage is exceeded, may be designated to either flow into a diked area or be exported out of the lake system. The overflow quality is the quality of the main lake water.

Use of The Model

This model may be used to determine the effect on lake water volume and/or conservative salt concentration in response to changes in tributary inflow quantity or quality and/or to the diking of lake sub-areas. The normal mode of usage is to pick a historical period for which an adequate amount of tributary flow and quality, lake stage and quality, precipitation, and evaporation data are available or can be established. A simulation based on these data is run for the period, and the simulation results compared to the historical lake stage and quality profiles. Adjustments are then made to the data, if necessary, to complete the model calibration.

The next step is to verify the model, if possible, by running a simulation for a historical time period that was not used to calibrate the model. Normally, this verification is conducted by inputting the hydrologic flows, precipitation and evaporation and then comparing the simulated quality to the historical quality record. Additional adjustments to the data are then made, if necessary. The model is finally used to predict the outcome of changes in the lake system. Of particular interest are changes in lake volume (stage) and quality (salt concentration) caused by diking sub-areas of the lake system or by changing inflow quantity or quality.

Date Requirements

The model is essentially a "bookkeeping" model and requires the following data:

Stage - Area - Volume Tables -

These values must be established for the total lake and each sub-area in the lake system.

Tributary Flow-Quality Tables -

The correlation between flowrate in cfs and ion concentration in mg/l must be made for every inflow to the system, also for the outflows if any.

Tributary Flowrates -

These average flowrates (or volumes) including groundwater, must be determined for each time step of the desired simulation.

Precipitation and Evaporation -

These values (depths in inches or feet) must be determined for each sub-area for each time step.

Circulation -

If there is appreciable circulation between the main lake and bays during the selected time period step, and if the quality in a bay is markedly different than the main lake, it may be necessary to specify the fraction of the bay volume that is exchanged with lake water during each period. Circulation is very difficult to measure accurately, but calibration runs for different values may lead to acceptable estimates for the circulation.

USER'S GUIDE - SIMULATION MODEL

The purpose of this guide is to present instructions to the user on data preparation and coding, as well as on the interpretation of simulation results.

Accuracy and Completeness of Data

For most lakes, there are only limited data available. One of the major challenges in using the model is to establish the hydrologic, climatic, and quality data to the precision necessary to give sufficiently accurate simulation results. The relationship between data and simulation precision is difficult to establish, but one must still be sensitive to discrepancies in, or validity of, data used; and then refine the data as model simulations indicate the response (sensitivity) to various input data variations. Such sensitivity results will indicate the data that are most critical in obtaining better simulations--be it flows, quality, evaporation, precipitation, or other factors.

Several factors need to be considered initially to set the framework for data evaluation, such as, average detention times, lake circulation and mixing characteristics, volume/surface area ratio, areal and temporal variation in precipitation and evaporation, interest in short or long term variations, and intended use of the resulting simulations. All of the factors must be weighted in view of the model limitations as imposed by the basic assumption of an incremental time, well-mixed system. The time step to be used is a major outcome of careful consideration of these factors.

Problem Preparation and Coding

The following steps must be completed prior to running a simulation:

1. On a map or sketch of the lake system, establish the imaginary boundaries between the main lake and the bays (9 maximum). Assign the integer 1 to the main lake and a unique integer to each bay using any integer 2 through 10.
2. Determine the stage, area, and volume table for each sub-area as well as the total lake system. A maximum of 15 discrete common values for stages may be used to describe the curves.
3. Identify all tributaries to the lake system including outflows and groundwater inflows. Assign each one a unique integer code number, using any integer 1 through 60.
4. Establish a flowrate-quality table for each tributary and each ion desired. A maximum of four coordinate points may be used to describe each relationship (flow, quality). Flow may be given in cubic feet per second (cfs) or else acre feet per month (ac ft/mo). Quality may be given in milligrams per liter (mg/l) or else tons per acre foot (taf).

5. Determine the flow for each tributary for every time period in the simulation--may be given as cubic feet per second or acre feet per second, day, week, month, or year.
6. Determine the precipitation and evaporation for each sub-area for each time period in inches or feet per day, week, month, or year.
7. Other factors that may be needed for given runs are:
    a. Stage at which overflow is to occur from main lake.
    b. Areas to be diked off.
    c. Intermixing (circulation) fractions during any time period.

Date Input Structure

The subroutine DATA reads and manipulates the data. The data is structured to be read in by segments. The segments are identified by a five-digit number punched in the first five columns of the first card in each segment. 88888 ends any segment, 99999 ends the data search for the current simulation, and 12345 ends the run.

Segment Identification Codes -

Segment	Subsegment	Information
11111		Initialization and setup.
	12111	Project Name/Description Title Number of time periods. Beginning lake stage. Data tape read or write code.
	13111	Ions to be considered.
	14111	Key for outflow quality.
	15111	Number of diked bays and their code number. Diked bay to receive overflow. Stage of lake at overflow.

(continued)

Segment	Subsegment	Information
		Volume of lake system at overflow stage. Tributaries from diked bay to be reassigned to another bay.
	16111	Number of tributary bays and their code numbers. Names of bays.
	17111	Intermixing (circulation) fraction for bays in each time period.
	18111	Output codes - controls amount of data printed out.
	19111	Multipliers for all flows, precipitation, and evaporation data.
	19511	Multipliers for specified tributaries.
22222		Tributaries flowing into each bay.
33333		Tributaries flowing out of the system. Tributary flowrates for each time period.
44444		Tributary water quality and flowrate correlations.
55555		Precipitation data.
66666		Evaporation data.

(continued)

Segment	Subsegment	Information
77777		Stage, area and volume data.
88888		End of segment.
99999		End of data (for this simulation).
12345		End of simulations.

The data segments may be submitted in any order and only those segments required for a given simulation need be included.

Data Card Description -

Data card descriptions are found below

Segment 11111

Subsegment 12111 (Begins at statement 120 in subroutine DATA)

Card 1 (Title)

60
Title 15A4

Card 2 (Time periods)

5	10
NINT 15	KEY 15

NINT = The number of time periods in the simulation - dimensioned for a max of 50

KEY = The time period key = 1, one day
= 2, one week
= 3 or 0, one month
= 4, one year

Card 3 (Beginning stages)

10	20	30	40	50	
S(11)	S(1)	S(2)	S(3)	S(4)	...

F10.0's

The beginning stages for each of the subareas in the lake system (any zero values are set equal to S(11) which is the stage for the entire interconnected lake system)

Subsegment 13111

Card 1 (Quality factors)

5	10	15	20	
NIONS	IONS(1)	IONS(2)	IONS(3)	...

I5's

NIONS = The number of ions to be simulated
IONS(1) = The code number of the first ion
IONS(2) = The code number of the second ion
⋮ = etc

Subsegment 14111

Card 1 (Outflow Quality)

5
QOF F5.0

QOF = Key for the ion concentration in the lake outflow:

≠ 1 means the specified quality will be used
= 1 means simulated lake quality will be used

Card 2 (Initial ion concentrations-- one for each bay and ion)

5	10	15	25
I	J	K	C
15	15	15	F10.0

I = Bay code number
J = Code number of quality factor (ion)
K = Unit key
≠1,unit of C is mg/l
=1,unit of C is tons/ac ft.
C = Initial concentration of specified ion in the specified bay

---

Subsegment 15111

Card 1 (Diked bays)

5	10	15	20	25
NOBD	BAY1	BAY2	BAY3	...

←I5's→

NOBD = The number of bays to be diked off from main lake
BAY1 = The code number of the first bay.
BAY2 = The code number of the second bay.
⋮ etc.

Card 2 (Overflow assignment)

5	15	25
IBOF	SOF	VOLOF
15	F10.0	F10.0

IBOF = Code number of diked bay to receive lake overflow if any, 0 means overflow is exported.
SOF = The lake stage at which overflow occurs.
VOLOF = The lake volume, excluding diked areas, at which overflow occurs

Card(s) 3 (Tributary reassignment)

5	10	15	20	25	
I	II	TR1	TR2	TR3	....

← 15's →

I = Diked bay code number.
II = Code number of bay to receive diked-bay tributary flow.
TR1 = Code number of first tributary reassigned.
TR2 = Code number of second tributary reassigned.
⋮ = etc.

Subsegment 16111

Card 1 (Bay code numbers)

5	10	15	20	
NBAYS	IBAY(1)	IBAY(2)	IBAY(3)	... (10 subareas max)

NBAYS = The total number of subareas in the lake including the main lake - the main lake is always the first specified.
IBAY(1) = The main lake code number.
⋮ = etc.

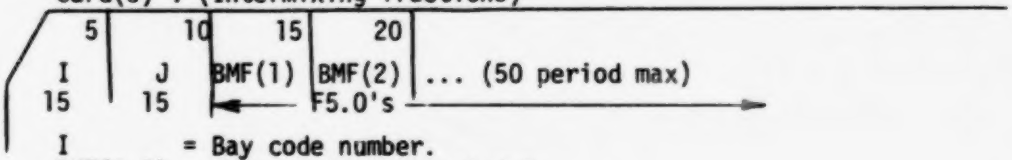
Card 2 (Subarea names)

8	16	
NAMEB(1) A8	NAMEB(2) A8	etc.

NAMEB(1) = Name of bay 1 (8 characters max).
NAMEB(2) = Name of bay 2.
⋮ = etc.

Subsegment 17111

Card(s) 1 (Intermixing fractions)



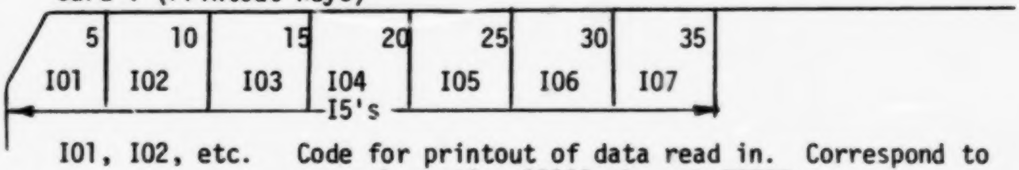
5
10
15
20
I
J
BMF(1)
BMF(2)
... (50 period max)
I5
I5
F5.0's

I = Bay code number.
BMF(I,1) = Intermixing in period 1.
BMF(I,2) = Intermixing in period 2.
⋮ = etc.

Note: READ is terminated by a negative number that is entered in the first F5.0 field after the last period BMF.

Subsegment 18111

Card 1 (Printout keys)

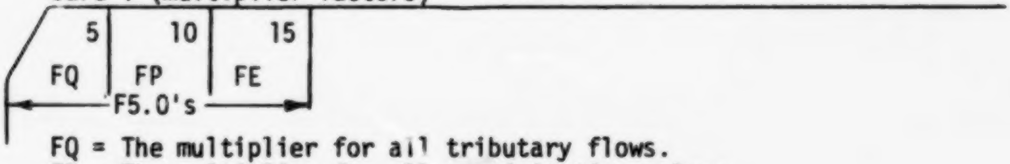


5
10
15
20
25
30
35
I01
I02
I03
I04
I05
I06
I07
I5's

I01, I02, etc. Code for printout of data read in. Correspond to each section 11111 through 77777.
≠ 1 Print out data.
= 1 Don't print out data.

Subsegment 19111

Card 1 (multiplier factors)



5
10
15
FQ
FP
FE
F5.0's

FQ = The multiplier for all tributary flows.
FP = The multiplier for all precipitation values.
FE = The multiplier for all evaporation values.

Note: Set to 1 if zero.

Subsegment 19511

Card 1 (Selected flowrate multipliers)

5	10	15	20	25
NTC	ITC(1)	FTC(1)	ITC(2)	FTC(2)
I5	I5	F5.0	I5	F5.0

NTC = Number of tributaries to have flowrates changed.
ITC = The tributary code number.
FTC = The multiplier for the flowrates.

Segment 22222 (Begins at statement 200)

Card 1 Tributary assignment)

5	10	15	20	
I	NTRIB	ITBAY(I,1)	ITBAY(I,2)	etc.

← I5's →

I = Bay code number
NTRIB = Number of tributaries to the bay.
ITBAY(I,1) = Code number of first tributary.
ITBAY(I,2) = Code number of second tributary.

Note: 50 tributary max per bay, 60 total.

Segment 33333 (Begins at statement 300)

Card 1 (Outflowing tributaries)

5	10	15	
NTO	ITOS(1)	ITOS(2)	etc. (7 max)

← I5's →

NTO = Number of outflows.
ITOS(1) = The code number of the first tributary outflow.
ITOS(2) = The code number of the second tributary outflow.
⋮

Card(s) 2 (Tributary Flowrates--one set of cards for each tributary)

5	10	15	20	25	30	
I	J	K	L	FLOWS(I,1)	FLOWS(I,2)	...
I5	I5	I5	I5	F5.0's		

I = The tributary code number.
J = Flow unit key.
  0 = cfs
  1 = ac ft
K = Time unit key.
  0 = secs
  1 = day
  2 = week
  3 = month
  4 = year
L = Number of flows on card(s)

Note: The flow volume specified is for the time increment used.

Segment 44444 (Begins at statement 400)

Card(s) 1 (Quality of tributaries)

5	10	15	20	25	30	
I	J	K	L	QF(I,J,1)	QF(I,J,2)	...
I5	I5	I5	I5	F10.0	F10.0	

I = Tributary code number.
J = Quality factor code number.
K = Flowrate unit key.
  ≠ 1, cfs.
  = 1, ac ft/month.
L = Quality unit key.
  ≠ 1, mg/l.
  = 1, tons/ac ft.
QF(I,J,1) = Flowrate or volume.
QF(I,J,2) = Quality (concentration).
⋮ = etc.
- max of 4 points (4 flowrate, 4 quality).

Segment 55555 (Begins at statement 500)

Card(s) (Precipitation)

5	10	15	20	25	30	
I	J	K	L	PREC(I,1)	PREC(I,2)	etc.
I5	I5	I5	I5	F5.0	F5.0	

Note: READ terminated by number less than zero in the field immediately after the last EVAP entry.

I = Bay code number.
J = Precipitation unit key.
    ≠ 1, inches.
    = 1, feet.
K = Time unit key.
    0 = month.
    1 = day.
    2 = week.
    3 = month.
    4 = year.
L = Repeat period key
    = 0, repeat the first 12 by 12's through 48.
    ≠ 0, no effect.

PREC: The precipitation for period 1.
    etc.

Segment 66666 (Begins at statement 600)

Card(s) 1 (Evaporation)

5	10	15	20	25	30	
I	J	K	L	EVAP(I,1)	EVAP(I,2)	etc.
I5	I5	I5	I5	F5.0	F5.0	

Note: READ is terminated by a number less than zero.

Segment 77777 (Begins at statement 700)

Cards 1 (stages)

5	10	20	30	40	
10011	J	STAGE(1)	STAGE(2)	STAGE(3)	etc.(2 cards)
I5	I5	← F10.0's →			

10011 = Code for setting up the lake stages for which area and volume values will be given below.
J = Stage unit key.
≠ 1, feet.
= 1, inches.
STAGE = The stages.

Card(s) 2 (Surface area values)

5	10	20	30	40	
200I	J	AREA(I,1)	AREA(I,2)	AREA(I,3)	etc. (2 cards per area
I5	I5	← F10.0's →			

200I = The code number of the subarea. The leading digits digits 200 identify the data as area data. I = 11 is the area information for the total lake system.
J = The area unit key.
≠ 1, acres.
= 1, sq. ft.

AREA = The areas at each stage specified above.

Card(s) 3 (Volume values)

5	10	20	30	40	
300I	J	VOL(I,1)	VOL(I,2)	VOL(I,3)	etc. (2 cards per area)
I5	I5	← F10.0's →			

300I = The code number of the subarea. The leading digits 300 identify the data as volume data. I = 11 is the volume information for the total lake system.
J = Volume unit key.
≠ 1, ac ft.
= 1, cu ft.
VOL = The volume at each stage specified above.

PROGRAMMING GUIDE, SIMULATION MODEL.

The purpose of this programming guide is to give the LKSIM program listing and briefly describe the program.

The complete LKSIM program as printed on the computer is listed on the following pages. Numerous comments have been included in the program to aid in understanding of the information flow and computational steps.

The program is written in FORTRAN IV and requires about 30K words of program space in its present form.

All of the system resides simultaneously in core except for some of the data which may be written and read from external Unit 1 as set up in subroutine TAPE. It would be easy, however, to separate the subroutine DATA as a separate first link.

The subroutine PLOTRS plots the simulation results on the lineprinter. It is necessary to substitute Plot calls as required for the x-y plot available on the computer used.

```
C  ***--------------------- - --
C  *** GENERAL DESCRIPTION
C  *** THIS PROGRAM CALCULATES THE WATER BALANCE AND CONCENTRATION OF
C  *** CONSERVATIVE SALTS IN A WELL-MIXED LAKE SYSTEM.  THE PROGRAM
C  *** IS BASICALLY A 'BOOKKEEPING' MODEL--IT REQUIRES THAT ALL OF THE
C  *** INFLOWS, THE CONCENTRATION OF THE CONSERVATIVE SALTS IN THE INFLOWS,
C  *** EVAPORATION, PRECIPITATION, AND THE STAGE-AREA-VOLUME TABLES BE
C  *** SETUP AS DATA FOR THE SIMULATION.
C  ***---------------------------------------------------------------------
C  ***
C  *** THE CONCEPTUAL LAKE SYSTEM, FOR WHICH THE MODEL IS STRUCTURED, IS
C  *** A MAIN LAKE THAT HAS SATELLITE BAYS  CONNECTED TO IT.  EACH OF THE
C  *** BAYS, AS WELL AS THE MAIN LAKE, ARE ASSUMED TO BE COMPLETELY-MIXED,
C  *** SEPERATE BODIES OF WATER DURING THE TIME PERIOD SELECTED FOR EACH
C  *** STEP IN THE WATER QUALITY SIMULATION.  ALL OF THE TRIBUTARY INFLOW,
C  *** PRECIPITATION, AND EVAPORATION VOLUMES ARE ACCOUNTED FOR IN EACH
C  *** AREA (BAYS AND MAIN LAKE) DURING THE TIME PERIOD   THE RESULTING
C  *** CONCENTRATIONS OF CONSERVATIVE SALTS ARE CALCULATED FOR EACH AREA,
C  *** THEN THE VOLUME OF WATER REQUIRED TO FLOW ACROSS THE LAKE-BAY INTERFACES
C  *** SO AS TO ACHIEVE EQUILIBRIUM IS DETERMINED.  THESE VOLUMES ARE
C  *** COMPLETELY MIXED  IN THE RECIPIENT AREA.
C  *** ANY BAY(S) IN THE SYSTEM MAY BE DIKED OFF.  THE DIKED AREA IS THEN
C  *** CARRIED ALONG AS AN INDEPENDENT LAKE.  MANY OPTIONS FOR ALLOWING
C  *** OVERFLOW, TRIB REASSIGNMENT, INFLOW, EVAPORATION, AND PRECIPITATION
C  *** CHANGES WITHOUT CHANGING THE BASIC DATA ARE AVIALABLE.
C  *** (SEE THE DOCUMENTATION FOR DETAILS)
C  ***---------------------------------------------------------------------
C  *** ANY CIRCULATION BETWEEN THE LAKE AND A BAY DURING A TIME STEP CAN
C  *** BE IMPOSED BY SPECIFYING THE FRACTION OF THE BAY VOLUME THAT INTER-
C  *** CHANGES WITH THE LAKE  WATER DUE TO  THE CIRCULATION, IF ANY.
C  *** THIS MIXING OCCURS AT THE END OF THE PERIOD.
C  ***
C  *** VARIABLE DEFINITION
C  *** UNLABELED COMMON
C  *** ARRAYS
C  ***    IT(I)      DUMMY ARRAY USED FOR TEMPORARY DATA STORAGE
C  ***    Q(I)       DUMMY ARRAY USED FOR TEMPORARY DATA STORAGE
C  ***    ITBAY(I,J) CONTAINS THE CODE NUMBERS FOR THE TRIBUTARIES (J) FOR
C  ***               EACH BAY AREA (I).
C  ***    NTRIB(I)   CONTAINS THE NUMBER OF TRIBUTARIES  TO EACH BAY (I).
C  ***    FLOWS(I,J) CONTAINS THE FLOWRATES FOR EACH TRIBUTARY (I) FOR
C  ***               EACH TIME PERIOD (J).  MAY BE READ-IN WITH UNITS OF
C  ***               CFS  OR AC-FT. AND TIME UNITS OF SECONDS, DAYS, WEEKS,
C  ***               MONTHS, OR YEARS.  STORED INTERNALLY WITH CFS UNITS
C  ***    QF(I,J,K)  CONTAINS THE WATER QUALITY INFORMATION FOR EACH TRIB. (I)
C  ***               AND QUALITY FACTOR (J).  ODD VALUES OF K CONTAIN THE
C  ***               FLOWRATE IN CFS AND THE EVEN VALUES THE CONCENTRATION
C  ***               IN MG/L.  THESE FOUR POINTS SPECIFY THE FLOW-CONC
C  ***               RELATIONSHIPS FOR EACH TRIBUTARY.
C  ***    IONS(I)    CONTAINS THE CODE NUMBERS OF THE IONS TO BE TRACED IN
C  ***               THE SIMULATION.
C  ***    COFIN(I,J) CONTAINS THE CURRENT CONC (WATER QUALITY) FOR EACH BAY
```

```
C  ***              (I) AND EACH ION (J).
C  ***   STAGE(I)  CONTAINS THE ELEVATIONS OF WATER SURFACE THAT MATCH
C  ***              UP WITH THE AREA AND VOLUME ARRAYS.  THESE ARRAYS GIVE
C  ***              THE STAGE-AREA-VOLUME RELATIONSHIPS FOR THE LAKE SYSTEM.
C  ***   AREA(I,J) CONTAINS THE SURFACE AREA VALUES (J) FOR EACH BAY (I).
C  ***              AREA MAY BE READ IN AS SQ-FT OR ACRES,  STORED AS ACRES.
C  ***   VOL(I,J)  AS FOR AREA, READ-IN AS AC-FT OR CU-FT, STORED AS AC-FT.
C  ***   PREC(I,J) CONTAINS THE PRECIPITATION FOR EACH BAY (I) FOR EACH TIME
C  ***              PERIOD (J).  MAY BE READ IN AS INCHES OR FEET PER DAY,
C  ***              WEEK, MONTH,  OR YEAR.  STORED AS FT PER MONTH.
C  ***   EVAP(I,J) CONTAINS THE EVAPORATION FOR EACH BAY (I) FOR EACH TIME
C  ***              PERIOD (J).  MAY BE READ IN AS INCHES OR FEET PER DAY,
C  ***              WEEK, MONTH, OR YEAR.  STORED AS FT PER MONTH.
C  ***   NBD(I)    CONTAINS THE CODE NUMBERS OF ANY DIKED BAYS.
C  ***   ITNA(I,J) CONTAINS THE CODE NIMBERS OF TRIBUTARIES OF ANY DIKED
C  ***              BAY (I) WHICH ARE TO BE ASSIGNED TO ANOTHER BAY FOR
C  ***              THE SIMULATION.  THIS CHANGE MAY ALSO BE MADE BY
C  ***              CHANGING THE BASIC TRIBUTARY ASSIGNMENT DATA CARDS.
C  ***   IBAYS(I)  CONTAINS THE CODE NUMBERS OF THE BAYS IN THE SYSTEM
C  ***              TO BE SIMULATED.  IBAY(1) ALWAYS AUTOMATICALLY CONTAINS
C  ***              NUMBER 11 WHICH IS THE CODE FOR THE ENTIRE LAKE SYSTEM.
C  ***              IBAY(2) IS ALWAYS ASSUMED TO BE THE MAIN LAKE.
C  ***   SALTS(I)  CONTAINS THE CURRENT SALT ACCUMLATION FOR ION I.
C  ***   DELV(I)   CONTAINS THE REQUIRED INTERFLOW VOLUME (WITH THE MAIN
C  ***              LAKE) DURING THE CURRENT PERIOD SO AS TO ACHIEVE
C  ***              EQUILIBRIUM AT THE END OF THE PERIOD.
C  ***   TITLE(I)  CONTAINS THE TITLE READ IN FOR THE RUN.
C  ***   NAMER(I,2)  CONTAINS THE NAME OF EACH BAY AREA (I).  8 CHARACTERS.
C  ***   INMIX(I)  A KEY ARRAY--IF IT CONTAINS 1 FOR BAY I THEN CIRCULATION
C  ***              (INTERMIXING) FRACTIONS ARE DESIRED FOR AT LEAST SOME
C  ***              OF THE TIME PERIODS--(FRACTION ARRAY IS BMF).
C  ***   BMF(I,J)  CONTAINS A FRACTION FOR EACH TIME PERIOD AND SPECIFIED
C  ***              BAY I.  IT IS THE FRACTION OF THE BAY VOLUME WHICH IS TO
C  ***              BE DISPLACED BY LAKE WATER  TO ACCOUNT FOR CIRCULATION
C  ***              FROM THE LAKE INTO THE BAY DURING THE TIME PERIOD.
C  ***   TOTSI(I)  ACCUMULATES THE TOTAL QUANTITY OF ION I WHICH FLOWS
C  ***              INTO THE LAKE SYSTEM DURING  THE SIMULATION.
C  ***   TOTSO(I)  AS ABOVE --FOR THE QUANTITY OUT OF THE SYSTEM.
C  ***   S(I)      CONTAINS THE CURRENT WATER SURFACE ELEV OF AREA I.
C  ***   IBTA(I)   CONTAINS THE NUMBER OF TRIBUTARIES FROM BAY I TO BE
C  ***              REASSIGNED TO ANOTHER AREA--FROM BEHIND THE DIKED BAY.
C  ***   TTF(I)    CONTAINS THE ACCUMULATIVE FLOW FOR TRIBUTARY I DURING
C  ***              THE SIMULATION.
C  ***   TTS(I,J)  CONTAINS THE ACCUMULATED ION (J) QUANTITY FLOWING INTO
C  ***              THE LAKE SYSTEM FROM EACH TRIBUTARY I.
C  ***   ITOS(I)   CONTAINS THE CODE NUMBERS OF THE TRIBUTARIES THAT FLOW
C  ***              OUT OF THE LAKE SYSTEM.
C  ***   COMMON VARIABLES
C  ***   NIONS      THE NUMBER OF IONS TO BE CARRIED IN THE SIMULATION.
C  ***   NOBD       THE NUMBER OF BAYS DIKED OFF FOR THE SIMULATION.
C  ***   INT        THE COUNTER (INDEX) FOR THE TIME PERIODS.
C  ***   NINT       THE NUMBER OF TIME PERIODS IN THE SIMULATION.
C  ***   NBAYS      THE NUMBER OF BAYS IN THE LAKE SYSTEM (INCLUDING THE
C  ***             MAIN LAKE).
C  ***   IT1       A KEY  FOR TAPE READ--IF = 1 SOME DATA IS READ FROM TAPE.
C  ***   IT2       A KEY  FOR TAPE WRITE--IF = 1 DATA SPECIFIED IN SUBR TAPE
C  ***             WILL BE WRITTEN TO DATA TAPE.
C  ***   TP        TOTAL PERIOD PRECIPITATION VOLUME FOR THE ENTIRE LAKE.
C  ***   TE        TOTAL PERIOD EVAPORATION VOLUME FOR THE ENTIRE LAKE.
C  ***   TQ        TOTAL PERIOD TRIBUTARY INFLOW FOR THE ENTIRE LAKE.
C  ***   IBOF      CODE NUMBER OF THE DIKED BAY WHICH IS TO RECIEVE ANY
C  ***             SYSTEM OVERFLOW--NEED NOT BE SPECIFIED.
C  ***   SOF       LAKE STAGE AT WHICH OVERFLOW OCCURS.
C  ***   VOLOF     VOLUME IN AC FT OF THE ENTIRE LAKE SYSTEM AT OVERFLOW
C  ***             STAGE, EXCLUDING DIKED AREAS.
C  ***   BVDB      VOLUME IN THE DIKED BAY WHICH IS TO RECEIVE ANY OVERFLOW
C  ***             --AT THE BEGINNING OF THE SIMULATION.
C  ***   QOF       A KEY WHICH SPECIFIES WHETHER THE OVERFLOWING TRIBS
C  ***             ARE TO CARRY ION
C  ***             CONCENTRATIONS SPECIFIED IN ARRAY QF(KEY NOT = 1) OR THE
C  ***             CURRENT LAKE QUALITY--KEY=1
C  ***   FT        THE ACCUMULATIVE TOTAL TRIB. INFLOW FOR THE ENTIRE
C  ***             LAKE, EXCLUDING DIKED AREAS AND OUTFLOWS.
C  ***   VOFS      THE ACCUMULATIVE VOLUME IN AC FT OF ANY OVERFLOW FROM
C  ***             THE LAKE SYSTEM.
C  ***   IO1       A KEY WHICH CAUSES THE PERIOD TRIB FLOW AND QUALITY
C  ***             TO BE PRINTED OUT IF THE KEY = 1
C  ***   TIMEF     THE MULTIPLIER THAT CORRECTS THE FLOW, PREC, AND EVAP
C  ***             TO BE CORRECTED TO THE TIME PERIOD SPECIFIED.
C  ***------------------------------------------------------------------------
C  *** LABELED COMMON
C  *** ARRAYS
C  ***    A(I)     CONTAINS THE CURRENT WATER SURFACE AREA FOR EACH BAY I.
C  ***    V(I)     CONTAINS THE CURRENT VOLUME OF WATER IN EACH BAY I.
C  ***    VT(I)    CONTAINS THE CURRENT TOTAL VOLUME OF WATER THAT FLOWED
C  ***             INTO THE BAY I DURING THE CURRENT TIME PERIOD.
C  ***    P(I)     CONTAINS THE CURRENT PRECIPITATION VOLUME THAT FELL
C  ***             ON THE BAY I DURING THE CURRENT TIME PERIOD.
C  ***    E(I)     CONTAINS THE CURRENT EVAPORATION VOLUME DURING THE PERIOD.
C  ***
C  ***
C  ***------------------------------------------------------------------------
C  *** THIS MAIN PROGRAM CONTROLS THE SIMULATION.  IT STEPS THROUGH THE NUMBER
C  *** OF TIME INTERVALS, NINT, TABULATES AND PLOTS THE RESULTING WATER QUALITY.
C  ***------------------------------------------------------------------------
C  ***
      COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
     2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
     3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
     4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
     5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
     6 TTF(60), TTS(60,12), ITOS(7),
     7 NIONS, NOBD, INT , NINT, NBAYS, IT1, IT2, TP, TE, TQ, IBOF, SOF,
     8 VOLOF, BVDB, QOF, FT, VOFS, IO1, TIMEF
      COMMON /STVL/    A(11), V(11), VT(11), P(11), E(11)
      DIMENSION NAMET(2), SS(12), TES(10), TPS(10), TQS(10), VB(11),
       2 SB(11)
        CALL IFILE(5,'TEMP')
        DATA NAMET /'  MO','NTHS'/
C  ***
        IBAYS(1)=11
10      CALL DATA
        IF(SOF .EQ. 0.)SOF=1.E6
97      FORMAT(1H1)
        WRITE( 6,3005) TITLE
        WRITE(6,108)
108     FORMAT(1H0, '---BEGIN THE SIMULATION---')
        WRITE(6,110)
110     FORMAT(1H0, 10X, '***INITIAL CONCENTRATIONS'/)
C  ***
C  ***-----------------------------------------------------------------------
C  *** THE PRINTOUTS IN THE MAIN PROGRAM ARE BASED ON THE IONS BEING
C  *** SPECIFIED IN THE FOLLOWING ORDER WITH NO OMISSIONS--
C  ***   NO.  ION  CODE NO
C  ***    1    TDS    1
C  ***    2    NA     2
C  ***    3    CA     3
C  ***    4    MG     4
C  ***    5    K      5
C  ***    6    CL     6
C  ***    7    HCO3   7
C  ***    8    SO4    8
C  ***    9    NO3    9
C  ***   10    PO4   10
C  ***------------------------------------------ ----------------------------
C  ***
        WRITE(6,120)
120     FORMAT(1H ,10X,'BAY    TDS',7X,'NA',7X, 'CA',7X, 'MG',7X, 'K',8X,
       2 'CL',6X, 'HCO3',5X, 'SO4',7X, 'NO3',6X, 'PO4',7X)
        VOFS=0.
        NX=NBAYS+1
        DO 20 II=2,NX
        I=IBAYS(II)
        TES(I)=0.
        TPS(I)=0.
        TQS(I)=0.
20      WRITE(6,125) NAMEB(I,1),NAMEB(I,2), I, (COFIN(I,K), K=1,12)
125     FORMAT(1H , 2A4, I4, 1X, 15F9.2)
C  ***
C  ***-----------------------------------------------------------------------
C  *** WHEN ARG=0, THE SUBR SAV RETURNS THE AREA AND VOL OF EACH AREA
C  *** FOR THE GIVEN STAGES OF EACH ONE.
C  ***-----------------------------------------------------------------------
C  ***
        CALL SAV(0)
        IF(IBOF .EQ. 0) GOTO 22
        BVDB=V(IBOF)
22      WRITE(6,130)
130     FORMAT(//1H0, 5X, 'BAY   NO.  STAGE     AREA     VOLUME')
```

```
        DO 25 II=2,NX
        I=IBAYS(II)
        VB(I)=V(I)
        SB(I)=S(I)
25       WRITE(6,132) NAMEB(I,1), NAMEB(I,2),I,S(I), A(I), V(I)
132     FORMAT(1H , 2X, 2A4, I3, F9.2, 2F10.1)
        VB(11)=V(11)
        SB(11)=S(11)
        WRITE(6,133) S(11), A(11), V(11)
133     FORMAT(1H0, 2X, 'TOTAL LAKE', F10.2,2F10.1)
        IX=0
        GOTO 92
30      IX=1
        DO 35 II=1,NIONS
        I=IONS(II)
        SALTS(I)=0.
35      SS(I)=Q(I)
        N=1
        VS=V(11)
        CALL PLOTRS(N,  VS)
C   ***
C   ***-----------------------------------------------------------------------
C   *** STEP THROUGH THE TIME INTERVALS NINT--THE TIME INTERVAL MAY BE
C   *** ANY DESIRED,  IF THE DATA BASE IS SET UP FOR IT.
C   ***
C   *** SUBR COM CALCULATES ALL OF THE VOLUME AND QUALITY CHANGES DURING
C   *** THE TIME PERIOD INT.
C   ***-----------------------------------------------------------------------
C   ***
        DO 90 INT=1,NINT
        N=N+1
        CALL COM
        WRITE( 6,3005) TITLE
        WRITE(6,135) INT, NAMET
135     FORMAT(1H0, 10X, '***SUMMARY INFORMATION FOR TIME PERIOD', I3,
       2 5X,'--',2A4)
        WRITE(6,145)
145     FORMAT(  1H0, 10X, '*** PERIOD FLOWS AND INTERFLOWS')
        WRITE(6,150)
150     FORMAT(1H0, 7X, '     BAY     PRECIP   EVAP   SUM TRIB   VOL BEFOR
       2E   INTERFLOW      F I N A L'/9X,'NAME  NO,   AC-FT   AC-FT INFLOW
       3 AC-FT  INTERFLOW   VOL AC-FT  STAGE     AREA     VOLUME')
        DO 40 II=2,NX
        I=IBAYS(II)
        WRITE(6,160)NAMEB(I,1),NAMEB(I,2),I,P(I),E(I),VT(I),Q(I),DELV(I),
       2 S(I), A(I), V(I)
160     FORMAT(  1H ,5X,2A4, I3, 2F9.0, F10.0, 2F12.0, F9.2, 2F10.0)
        TES(I)=TES(I) + E(I)
        TPS(I)=TPS(I) + P(I)
        TQS(I)=TQS(I) + VT(I)
40      CONTINUE
        TQS(1) = TQS(1) - FLOWS(53,INT) * 59.5041 * TIMEF
        WRITE(6,165) TP, TE, TQ, S(11), A(11), V(11)
```

```
165   FORMAT(1H0, 3X, 'TOTAL SYSTEM   ', 2F9.0, F10.0, 10X,'LAKE',2X,
     2F9.2, 2F10.0)
      WRITE(6,170)
170   FORMAT(//1H0, 5X, '*** WATER QUALITY AT THE END OF THE PERIOD'/)
      WRITE(6,120)
      DO 50 II=2,NX
      I=IBAYS(II)
      WRITE(6,175) NAMEB(I,1), NAMEB(I,2), I, (COFIN(I,K),K=1,NIONS)
175   FORMAT(1H , 2A4, I4, 1X, 12F9.2)
50    CONTINUE
      WRITE(6,180) N
180   FORMAT(////////1H0,5X,'***TIME PERIOD', I3, ' HAS BEGUN')
      VS=V(11)
      CALL PLOTRS(N,  VS)
90    CONTINUE
C  ***
C  ***-----------------------------------------------------------------------
C  *** THE SIMULATION IS COMPLETED AT THIS POINT--NOW THE TOTAL SALTS ARE
C  *** TABULATED FOR THE VARIOUS COMPONENTS IN THE SIMULATION.
C  ***
C  *** FACTOR F CONVERTS FROM MG/L AC-FT UNITS TO TONS.
C  ***-----------------------------------------------------------------------
C  ***
92    F=62.4*43560./2.E9
      DO 102 II=1,NIONS
      I=IONS(II)
      Q(I)=0.
      TOTSI(I)=TOTSI(I)*F
      TOTSO(I)=TOTSO(I)*F
      DO 100 KK=2,NX
      K=IBAYS(KK)
      Q(I)=Q(I) + COFIN(K,I)*V(K)
100   CONTINUE
      Q(I)=Q(I)*F
102   CONTINUE
      IF(IX .EQ. 0) GOTO 30
      WRITE( 6,3005) TITLE
      WRITE(6,182)
182   FORMAT(//1H0, 5X, '***TOTAL SALT SUMMARY FOR THE SIMULATION', //,
     2 25X, 'T  O  N  S')
      WRITE(6,120)
      WRITE(6,185) (TOTSI(K),K=1,NIONS)
      WRITE(6,186) (TOTSO(K),K=1,NIONS)
      WRITE(6,187) (SS(K),K=1,NIONS)
      WRITE(6,188) (Q(K),K=1,NIONS)
185   FORMAT(1H , 'TRIB. INFLOW' , F10.0,11F9.0)
186   FORMAT(1H0, 'LAKE OUTFLOW', F10.0, 11F9.0)
187   FORMAT(1H , 'LAKE . . '/,'   BEGINNING ',F10.0, 11F9.0)
188   FORMAT(1H , '  ENDING    ', F10.0, 11F9.0)
      WRITE( 6,3005) TITLE
      WRITE(6,2100)
2100  FORMAT(//1H0,5X,'***TRIBUTARY FLOWS AND SALT QUANTITIES')
2110  FORMAT(1H0, 20X, 'SALTS-- TONS TOTAL FOR THE SIMULATION')
```

```
        IC=0
        DO 220 II=2,NX
        I=IBAYS(II)
        WRITE(6,2110)
        WRITE(6,2120) I
2120    FORMAT(1H0,'BAY',I3)
        WRITE(6,120)
        WRITE(6,2130)
2130    FORMAT(1H , 'TRIB.   FLOW', /, 8X, 'AC-FT')
        N1=NTRIB(I)
        DO 220 JJ=1,N1
        IC = IC+1
        J=ITBAY(I,JJ)
        F1= TTF(J) / FT * 100.
        IF(J .EQ. 53) F1=100.
        DO 210 KK=1,NIONS
        K=IONS(KK)
        TTS(J,K) = TTS(J,K) * F
        T = TOTSI(K)
        IF(J .EQ. 53) T = TOTSO(K)
        SALTS(K) = TTS(J,K) / T * 100.
210     CONTINUE
        IF(IC .LT. 12)GOTO 215
        WRITE( 6,3005) TITLE
        WRITE(6,2195)
2195    FORMAT(1H , '---CONTINUED'/)
        WRITE(6,2120) I
        WRITE(6,120)
        WRITE(6,2130)
        IC=0
215     WRITE(6,2200)J, TTF(J), (TTS(J,K),K=1,NIONS)
2200    FORMAT(1H , I2, F10.0, F9.0, 7F9.2, 4F9.3)
        WRITE(6,2210) F1, (SALTS(K),K=1,NIONS )
2210    FORMAT(1H , 4X, 'PCT', F7.3, 12F9.3)
        WRITE(6,2220)
2220    FORMAT (1H0)
220     CONTINUE
C  ***
C  ***---------------------------------------------------------------------------
C  *** THE FOLLOWING STATEMENTS CALCULATE AND PRINT OUT THE WATER
C  *** BALANCE FOR THE SIMULATION PERIOD
C  ***---------------------------------------------------------------------------
C  ***
        WRITE( 6,3005) TITLE
3005    FORMAT(1H1,//,10X, 15A4)
        WRITE(6,3000)
3000    FORMAT(// 1H0, 5X, '***WATER BALANCE FOR THE SIMULATION')
        WRITE(6,3010)
3010    FORMAT(1H0, 10X, 'BAY  PRECIP    EVAP  TRIB INFLOW      BEGINNING
       2      ENDING ',/, 16X, 'AC-FT    AC-FT     AC-FT     STAGE   VOLUM
       3E   STAGE   VOLUME ')
        TE=0.
        TP=0.
```

```
      TQ=0.
      DO 320 II=2,NX
      I=IWAYS(II)
      WRITE(6,3020) NAMEB(I,1), NAMEB(I,2),I, TPS(I), TES(I), TOS(I),
     2 SR(I), VB(I), S(I), V(I)
3020  FORMAT( 1H , 2A4, I4, 3F9.0, 3X, 2(F8.2,F9.1))
      IF(NBD(I) .EQ. 1) GOTO 320
      TE=TE + TES(I)
      TP=TP + TPS(I)
      TQ=TQ + TOS(I)
320   CONTINUE
      CHECK = TP - TE + TQ + TTF(53) - V(11) + VB(11) - VOFS
      WRITE(6,3030)
      WRITE(6,3040) TP, TE, TQ, TTF(53), VOFS, VB(11), SR(11), V(11),
     2 S(11)
3040  FORMAT( 1H , 5X, 'TOTAL PRECIPITATION=', F11.1,/,6X, 'TOTAL EVAPOR
     2ATION  =', F11.1,/, 6X, 'TOTAL TRIB. INFLOW =', F11.1, /, 6X,
     3 'TOTAL TRIB. OUTFLOW=',F11.1,/,6X, 'OTHER OVERFLOW     =',F11.1,
     3' (ENDING VOLUME HAS BEEN ADJUSTED FOR OVERFLOW)',
     4 /,6X,'BEGINNING  VOLUME  =',F11.1, 5X, 'STAGE=', F8.2,/, 6X,
     5 'ENDING  VOLUME     =',F11.1, 5X, 'STAGE=', F8.2)
3030  FORMAT(//1H , 10X, '***TOTAL LAKE  --  AC-FT   (EXCLUDING DIKED BA
     2YS, IF ANY)')
      WRITE(6,3050) CHECK
3050  FORMAT(// 1H0, 5X, 'CHECK=', F11.1,'  (IF NOT ZERO--PROG ERROR)')
95    INT=999
C  ***
C  ***-------------------------------------------------------------------
C  *** THE PROGRAM NOW GOES BACK TO THE BEGINNING AND LOOKS FOR NEW DATA--
C  *** THE ONLY CHANGES IN THE DATA AS IT EXISTS AT THE END OF THIS
C  *** SIMULATION WILL BE THOSE SPECIFIED IN THE DATA FOUND--SEE SUBR DATA.
C  ***-------------------------------------------------------------------
C  ***
      GOTO 10
      END
      $
```

```
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        SUBROUTINE DATA
        C  ***
        C  ***-------------------------------------------------------------------------
        C  *** DATA HANDLES ALL OF THE DATA INPUT AND INITIALIZATION FOR THE
        C  *** SIMULATION.
        C  ***-------------------------------------------------------------------------
        C  *** THIS SUBR IS SET UP TO BE VERY FLEXIBLE AS TO THE AMOUNT OF DATA
        C  *** GIVEN FOR A RUN, AS WELL AS THE UNITS OF THE DATA.
        C  *** EACH TYPE OF DATA IS SET APART BY SPECIAL SECTION CARDS WHICH ARE
        C  *** DESCRIBED IN DETAIL IN THE DOCUMENTATION.
        C  ***
        C  *** INT IS SET TO 999 AT THE END OF EACH SIMULATION RUN.  THE PROGRAM
        C  *** THEN RETURNS TO THIS POINT AND LOOKS FOR NEW DATA FOR THE NEXT
        C  *** RUN.  IF A DATA CARD CONTAINING 12345 IN THE FIRST 5 COLUMNS IS
        C  *** FOUND THEN THE RUN IS ENDED.
        C  ***
        C  *** NORMALLY THE FLOW, QUALITY, EVAPORATION, AND PRECIPITATION INFORMATION
        C  *** AS WELL AS THE STAGE-AREA-VOLUME TABLES ARE WRITTEN TO TAPE
        C  *** DURING AN EARLY RUN AND THIS INFORMATION READ BACK FROM TAPE FOR
        C  *** ADDITIONAL RUNS. (SEE FORMATS 1230 AND 1240 BELOW).  THIS GREATLY R
        C  *** REDUCES THE NUMBER OF DATA CARDS TO BE SUBMITTED IN MOST CASES.
        C  ***-------------------------------------------------------------------------
        C  ***
        C  ***
                COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
              2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
              3 VOL(11,15), PREC(10,52), EVAP(10,52), NBO(10), ITNA(12,30),
              4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
              5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
              6 TTF(60), TTS(60,12), IIOS(7),
              7 NIONS, NOBD, INT , NINT, NBAYS, IT1, IT2, TP, TE, IQ, IQOF, SOF,
              8 VOLOF, BVOB, QOF, FT, VOFS, IQ1, TIMEF
               DIMENSION ITC(7), FTC(7), BGS(60,12)
               IF(INT .EQ. 999) GOTO 7
               SOF=1.E6
               DO 5 I=1,60
               DO 5 J=1,12
               FLOWS(I,J)=0.
               DO 5 K=1,7,2
               QF(I,J,K)=0.
        5      CONTINUE
               DO 6 I=1,11
         6     AREA(I,2)=0.
        7      DO 9 I=1,60
               DO 8 J=1,12
               COFIN(I,J) = BGS(I,J)
        8      TTS(I,J) = 0.
        9      TTF(I) = 0.
               FT = 0.
        C  ***
        C  ***-------------------------------------------------------------------------
        C  *** THE DATA READ FORMAT IS SET UP SO AS USE SEPERATOR CARDS TO KEY THIS
        C  *** SUBR. TO READ THE DATA SUBMITTED-- SEE DOCUMENTATION FOR DETAILS.
```

```
C  ***-----------------------------------------------------------------------,
C  ***
10     READ(5,1000) I
1000   FORMAT(15)
       IF(I .NE. 12345)GOTO12
       STOP
12     IF(I-11111) 50,20,15
15     IF(I-66666)30,40,45
20     IF(I .EQ. 11111) I=1
30     IF(I .EQ. 22222) I=2
       IF(I .EQ. 33333) I=3
       IF(I .EQ. 44444) I=4
       IF(I .EQ. 55555) I=5
       GOTO 50
40     IF(I .EQ. 66666) I=6
45     IF(I .EQ. 77777) I=7
       IF(I .EQ. 88888) GO TO 10
       IF(I .EQ. 99999) I=9
50     IF(I .GT. 9) GO TO 60
       GO TO 70
1020   FORMAT(1H0, '***DATA READ ERROR--SECTION CODE NOT FOUND--VALUE FOU
      2ND=',I6)
60     WRITE(6,1020) I
       IERR=1
       GO TO 10
70     GO TO (100,200,300,400,500,600,700,900,900),I
100    CONTINUE
103    READ(5,1000) I
104    IF(I-15111)105,110,115
105    IF(I .EQ. 12111) I=2
       IF(I .EQ. 13111) I=3
       IF(I .EQ. 14111) I=4
       GO TO 118
110    IF(I .EQ. 15111) I=5
115    IF(I .EQ. 16111) I=6
       IF(I .EQ. 17111) I=7
       IF(I .EQ. 18111) I=8
       IF(I .EQ. 19111) I=9
       IF(I .EQ. 19511) I=10
       IF(I .GT. 19511) GO TO 15
118    GO TO (103,120,130,140,150,160,170,180,190,195),I
C  ***
C  ***-----------------------------------------------------------------------
C  *** THIS PART OF THE DATA READ IS FOR  (1)  TITLE  (2) NO. OF TIME INCREMENTS
C  ***  AND(3) KEY FOR TAPE READ AND WRITE--FOR DATA INPUT
C  ***-----------------------------------------------------------------------
120    READ(5,1110) TITLE
C  ***
1110   FORMAT(15A4)
       WRITE(6,1090) TITLE
       READ(5,1200) NINT, KEY
       WRITE(6,1212) NINT, KEY
1212   FORMAT(1H0, 5X, 'THE NUMBER OF TIME INCREMENTS IN THIS SIMULATION
     2=', I3, //,6X, 'THE TIME PERIOD KEY IS =',I2)
      TIMEF = 1.
      IF(KEY .EQ. 1) TIMEF= .03333
      IF(KEY .EQ. 2) TIMEF= .23333
      IF(KEY .EQ. 4) TIMEF= 12.167
      READ(5,1215) S(11), (S(I),I=1,10)
1215  FORMAT(8F10.0)
      DO 125 I=1,10
      IF(S(I)) 122,122,125
122   S(I)=S(11)
125   CONTINUE
      WRITE(6,1220) (I,S(I),I=1,10)
1220  FORMAT(1H0, 5X, 'THE BEGINNING STAGES IN THE LAKE SYSTEM ARE',
     2 /, 5X, ' BAY   STAGE',/, 5X,     10(I3,F10.2,/, 5X))
      READ(5,1200) IT1, IT2
      IF(IT1 .EQ. 1) WRITE(6,1230)
1230  FORMAT(1H0, 5X, 'THE DATA WILL BE READ FROM TAPE --THEN MODIFIED
     2BY ANY CARDS READ')
      IF(IT1 .EQ. 1) CALL TAPE(1)
      IF(IT2 .EQ. 1) WRITE(6,1240)
1240  FORMAT(1H0, 5X, 'THE DATA SETUP FOR THIS SIMULATION WILL BE WRITTE
     2N TO THE DATA TAPE')
      WRITE(6,1111)
      GO TO 103
C  ***
C  ***---------------------------------------------------------------------
C  *** THIS SECTION READS THE NUMBER OF IONS TO BE TRACED (NIONS) AND THEIR
C  *** CODE NUMBERS (FOUND IN ARRAY IONS).
C  ***---------------------------------------------------------------------
C  ***
130   READ(5,1200) NIONS, (IONS(I),I=1,12)
      IF(IO1 .EQ. 1) GO TO 103
      WRITE(6,1111)
1111  FORMAT(1H0,5X,'**************************************************
     2******************************')
      WRITE(6,1210)
      WRITE(6,1111)
1210  FORMAT(1H0,   '$$$ SIMULATION SETUP AND INITIALIZATION DATA')
      WRITE(6,1350) (IONS(I),I=1,NIONS)
1350  FORMAT(1H0, 5X, 'IONS TO BE CARRIED IN THE SIMULATION=', 15I5)
      GO TO 103
C  ***
C  ***---------------------------------------------------------------------
C  *** THIS SECTION READS QOF WHICH IS THE KEY AS GIVEN IN FORMAT 1410 AND
C  *** ALSO READS THE INITIAL WATER QUALITY IN EACH OF THE LAKE AREAS.
C  ***---------------------------------------------------------------------
C  ***
140   READ(5,3035) QOF
      WRITE(6,1111)
      WRITE(6,1410) QOF
1410  FORMAT(1H0, 5X, '***QUALITY OUTFLOW FACTOR =', F5.0,/ ,10X, '0. ME
     2ANS THAT QUALITY READ IN FOR THE TRIB (OUTFLOW) WILL BE USED FOR T
     3HE OUTFLOW',/,10X, '1. MEANS THAT THE LAKE QUALITY WILL BE USED FO
```

```
              4R  THE OUTFLOW')
               IF(IO1 .EQ. 1) GO TO 142
               WRITE(6,1111)
               WRITE(6,1420)
               WRITE(6,1425)
        1420   FORMAT(1H0, 5X, 'INITIAL WATER QUALITY IN THE LAKE AND BAYS')
        1425   FORMAT(1H2, 5X, 'BAY  QUALITY  QUAL UNIT ', /6X,
              2 'NO.    F.C.       KEY    CONCENTRATION')
        142    READ(5,1430) I,J,K,C
               F1=1.
        1430    FORMAT(3I5,F10.0)
               IF(I .GT. 11111) GO TO 104
               IF(I .GT. 10) WRITE(6,1435) I
        1435   FORMAT(1H ,'***ERROR--BAY .GT. 10--INITIAL W. QUALITY CARD, #',I4)
               IF(K .EQ. 1) F1=.000736
               IF(IO1 .EQ. 1) GO TO 146
               WRITE(6,1440) I,J,K,C
        1440   FORMAT(I8,I7,I10, F13.3)
        146    COFIN(I,J)=C*F1
               GO TO 142
        C   ***
        C   ***----------------------------------------------------------------------
        C   *** THIS SECTION READS THE NUMBER OF DIKED BAYS NOBD IF ANY, AND
        C   *** STORES  1 IN ARRAY NBD INDICATIONG DIKING FOR ANY BAY NO. GIVEN.
        C   *** STATEMENT 153 READS THE CODE NUMBER OF THE BAY TO RECEIVE OVERFLOW
        C   *** IBOF AND THE STAGE AND VOLUME OF THE REMAINING LAKE SYSTEM WHEN
        C   *** OVERFLOW OCCURS (SOF AND VOLOF)  IF IBOF = 0 THEN OVERFLOW IS TO
        C   *** FLOW OUT OF THE SYSTEM AND NOT INTO ANY DIKED BAY.
        C   *** STATEMENTS STARTING WITH 155 REASSIGN ANY TRIBS. DESIRED TO FLOW
        C   *** INTO THE MAIN LAKE--TRIBS THAT WERE ASSIGNED TO THE DIKED BAY I.
        C   ***----------------------------------------------------------------------
        C   ***
        150    READ(5,1200) NOBD, ( IT(I),I=1,10)
               IF(NOBD .LT. 11)GOTO 151
               I=NOBD
               NOBD=0
               GO TO 104
        151    IF(NOBD .LE. 0) GOTO 153
               DO 152 I=1,NOBD
               J=IT(I)
        152    NBD(J)=1
               IF(IO1 .EQ. 1) GO TO 155
               WRITE(6,1111)
               WRITE(6,1510)  NOBD, ( IT(I),I=1,NOBD)
        1510   FORMAT(1H0, 5X, I3, ' BAYS DIKED OFF FOR THIS RUN, BAY NOS.',13I5)
        153    READ(5,1515) IBOF, SOF, VOLOF
        1515   FORMAT(I5,2F10.0)
               WRITE(6,1111)
               WRITE(6,1517) IBOF, SOF, VOLOF
        1517   FORMAT(1H0, 5X, 'BAY DESIGNATED TO RECEIVE ANY LAKE SPILLAGE IS',
              2 I3,' (0 MEANS THE SPILLAGE IS EXPORTED OUT OF THE SYSTEM)'//,
              3 10X,'STAGE AT OVERFLOW = ',F10.2,//,10X, 'VOLUME AT OVERFLOW=',
              4 F11.1)
```

```
155   READ(5,1200) I, II, (IT(J),J=1,14)
      IF(I .GT. 11111) GO TO 104
      IBTA(I)=II
      IB=-1
      IX=1
      IE=14
156   DO 157 J=IX,IE
      IF(IT(J) .LE. 0) GO TO 158
157   ITNA(I,J) = IT(J)
      IB=IB+16
      IX=IB
      IE=IE+16
      READ(5,1200) (IT(II),II=IX,IE)
      GOTO 156
158   J=J-1
      ITNA(1,I) = J
      IF(IO1 .EQ. 1) GO TO 155
      WRITE(6,1111)
      WRITE(6,1520)  I, IBTA(I), (IT(L),L=1,J)
1520  FORMAT(1H0, 5X, 'TRIBS FROM DIKED BAY', I3, ' WHICH ARE TO RUN INT
     2O BAY',I3, /,10X, 30I4)
      GO TO 155
C  ***
C  ***-------------------------------------------------------------------*
C  *** THIS SECTION READS THE NUMBER OF SUBAREAS IN THE LAKE SYSTEM (NBAYS)
C  *** PUTS THE CODE NUMBERS ASSIGNED TO EACH IN IBAYS.  THE NAME OF EACH
C  *** AREA IS THEN READ INTO NAMEB---8 CHARACTERS FOR EACH AREA)
C  *** -----------------------------------------------------------------*
C  ***
160   READ(5,1200) NBAYS, (IBAYS(I),I=2,11)
      IF(NBAYS .LT. 11) GOTO 162
      IF(I .LT. 22222) GOTO 104
      I=NBAYS
      J=16111
      WRITE(6,1610) J
1610  FORMAT(1H0, 10X, '***TROUBLE--NO. OF BAYS SPECIFIED .GT. 11, CHECK
     2 DATA SECTION', I7)
      GOTO 104
162   READ(5,1620)((NAMEB(I,J),J=1,2),I=1,10)
1620  FORMAT(20A4)
164   IF(IO1 .EQ. 1) GOTO 103
      WRITE(6,1111)
      WRITE(6,1640) NBAYS
1640  FORMAT(1H0, 5X, 'NO. OF SUBAREAS IN THE LAKE SYSTEM =',I3, 5X,
     2 'THEIR CODE NOS. AND NAMES ARE-')
      NX=NBAYS+1
      DO 166 I=2,NX
      J=IBAYS(I)
166   WRITE(6,1650)  J,       (NAMEB(J,K),K=1,2)
1650  FORMAT(1H , 5X, I2, 2X, 2A4)
      GOTO 103
C  ***
C  *** ------------------------------------------------------------------
```

```
C  *** THIS SECTION READS THE INTERMIXING FRACTIONS FOR ANY BAY SPECIFIED
C  *** I IS THE BAY NO.,            A DECIMAL FRACTION FOR EACH TIME PERIOD
C  *** THE READ IS TERMINATED BY A NEGATIVE REAL NUMBER.
C  ***----------------------------------------------------------------------
C  ***
170   WRITE(6,1111)
171   READ(5,1710) I, J, (Q(K),K=1,14)
1710  FORMAT(2I5, 14F5.0)
      IF(I .LT. 11) GOTO 172
      IF(I .LT. 22222) GOTO 104
      M=17111
      WRITE(6,1610) M
      GOTO 104
172   INMIX(I)=1
      DO 173 K=1,14
173   BMF(I,K)=Q(K)
      IB=-1
      IX=1
      IE=14
174   DO 176 K=IX,IE
      IF(BMF(I,K)) 178,176,176
176   CONTINUE
      IB=IB+16
      IE=IE+16
      IX=IB
      IF(IE .GT. 52) IE=52
      READ(5,3035) (BMF(I,K),K=IB,IE)
      GOTO 174
178   IF(IO1 .EQ. 1) GOTO 171
      K=K-1
      WRITE(6,1780)  I, (BMF(I,J),J=1,K)
1780  FORMAT(1H0, 5X, 'INTERMIXING FRACTIONS FOR BAY', I3, ' ARE  ',
     5 5(12F6.3,/, 44X))
      GOTO 171
160   READ(5,1200) IO1,IO2,IO3,IO4,IO5,IO6,IO7
      IF(IO1 .GT. 11111) GO TO 104
      GO TO 103
1200  FORMAT(16I5)
C  ***
C  ***----------------------------------------------------------------------
C  *** THIS SECTION READS DECIMAL FRACTIONS THAT BECOME MULTIPLIERS FOR ALL
C  *** FLOWS, PRECIP., AND EVAP. RESP. AS IN THE BASIC DATA.
C  *** THIS SECTION CAN CHANGE THE MAGNITUDE OF THE FLOWS FOR ALL OF THE
C  *** TRIBS.--THE SECTION BEGINNING WITH STATEMENT 195 CHANGES ONLY THE
C  *** TRIBS. SPECFICALLY GIVEN THERE.
C  ***----------------------------------------------------------------------
C  ***
190   READ(5,3035) FQ, FP, FE
      IF(FQ .LE. 0.) FQ=1.
      IF(FP .LE. 0.) FP=1.
      IF(FE .LE. 0.) FE=1.
      WRITE(6,1111)
      WRITE(6,1920) FQ, FP, FE
```

```
1920  FORMAT(1H0, 5X, '***THE MULTIPLIERS TO BE APPLIED TO THE INPUT DAT
     2A ARE', /,10X, 'FLOWS. . .', F6.3,/,10X, 'PRECIP . .' ,F6.3,/,10X,
     3 'EVAP . . .' ,F6,3)
      GO TO 103
195   READ(5,1950) NTC,(ITC(K), FTC(K),K=1,7)
1950  FORMAT(I5, 7(I5,F5,0))
      IF(NTC ,GT, 1111) GO TO 104
      IF(NTC ,LE, 0) GO TO 104
      WRITE(6,1960)       (ITC(K),FTC(K),K=1,NTC)
1960  FORMAT(1H0, 5X, 'THE FOLLOWING TRIBS WILL BE CHANGED BY THE FACTOR
     2 GIVEN--',/, 5X, 'TRIB,   FACTOR',/, 7(5X, I3, F9,3))
      GO TO 103
C  ***
C  ***-------------------------------------------------------------------
C  *** THIS SECTION READS THE TRIBS, THAT ARE TRIB TO EACH BAY, I=BAY NO,
C  *** N = NUMBER OF TRIBS TO THE BAY,
C  *** -----------------------------------------------------------------
C  ***
200   IF(IO2 ,EQ, 1) GO TO 210
      WRITE(6,1090) TITLE
1090  FORMAT(1H1//,9X,'TITLE-',15A4)
      WRITE( 6,1111)
      WRITE(6,2010)
2010  FORMAT(1H0,10X, 'BAY - TRIBUTARY ASSIGNMENT DATA')
      WRITE(6,2020)
2020  FORMAT(1H0, 5X, 'BAY   NO, OF    TRIBUTARY CODE NUMBERS'/1H ,
     2 11X,'TRIBS')
210   READ(5,2030) I,N,(IT(L),L=1,14)
2030  FORMAT(16I5)
      IF(I ,GT, 11110)GO TO 12
      IF(I ,GT, 10) GO TO 290
      DO 220 L=1,14
      ITBAY(I,L) = IT(L)
      NTRIB(I)=N
220   CONTINUE
      IF(N ,LT, 15) GO TO 230
      READ(5,2030) (ITBAY(I,M),M=15,N)
230   CONTINUE
      IF(IO2 ,NE, 1) WRITE(6,2040) I,N,(ITBAY(I,M),M=1,N)
2040  FORMAT(/5X,I3, I7, 5X, 6(10I5,/,22X))
      GO TO 210
290   WRITE(6,2100) I,N, (IT(L),L=1,14)
      IERR=1
      GO TO 210
2100  FORMAT(1H0, '***DATA READ ERROR--IN SECTION 22222--BAY CODE NO ,GT,
     2, 10' /1H ,5X, 'CARD IMAGE IS',16I5)
C  ***
C  ***-------------------------------------------------------------------
C  *** THIS SECTION READS THE NO, OF TRIBS, THAT FLOW OUT OF THE SYSTEM(NTO)
C  *** AND THEIR CODE NOS,-STATEMENTS 395 TO 398 CHANGE  THESE TRIBS TO NEG,
C  *** FLOWS,  IT THEN READS THE FLOW RATES (ST, 310), I = TRIB, NO,, J = FLOW
C  *** UNIT KEY, K = TIME UNIT KEY, L = NO, OF FLOWS,
C  ***-------------------------------------------------------------------
```

```
C  ***
300    READ(5,1200) NTO, (ITOS(I),I=1,7)
       IF(NTO .EQ. 0) GOTO 305
       IF(NTO .GT. 7) GO TO 104
       WRITE(6,1090)TITLE
       WRITE(6,3025)    (ITOS(I),I=1,NTO)
3025   FORMAT(1H0, 5X, '***THE TRIBS FLOWING OUT OF THE  SYSTEM ARE',
      2 5I4)
       IC=0
305    IF(IO3 .EQ. 1) GO TO 310
       WRITE(6,3010)
3010   FORMAT(1H0, 15X, 'TRIBUTARY FLOWRATE DATA')
       WRITE(6,3020)
3020   FORMAT(1H0, 5X, 'TRIB  FLOW UNIT  TIME BASE   F L O W S    PERIOD'
      2 /7X, 'NO      KEY       KEY      1       2       3 . . .')
310    READ(5,3030) I,J,K,L, (Q(M),M=1,12)
       F1=1.
       F2=1.
3030   FORMAT(4I5,12F5.0)
       IF(I .GT. 11110) GO TO 360
       IF(I .GT. 100) GO TO 390
       DO 320 M=1,12
       FLOWS(I,M) = Q(M)
320    CONTINUE
       IF(L .LT. 13) GO TO 330
       READ(5,3035) (FLOWS(I,M),M=13,L)
3035   FORMAT(16F5.0)
330    CONTINUE
       IF(IO3 .EQ. 1)GOTO 340
       IC=IC+1
       IF(IC .LT. 11)GOTO 335
       IC = 0
       WRITE(6,1090) TITLE
       WRITE(6,3010)
       WRITE(6,3015)
3015   FORMAT(1H , '--CONTINUED'/)
       WRITE(6,3020)
335    WRITE( 6,3040) I,J,K, (FLOWS(I,M),M=1,L)
3040   FORMAT(1H0, 5X,I3,I8,I11,2X,  6(12F8.1,/30X))
340    IF(J .EQ. 1) F1=43560.
       IF(K .EQ. 0) GO TO 350
       GO TO (342,344,346,348),K
342    F2=8.64E4
       GO TO 350
344    F2=6.048E5
       GO TO 350
346    F2=2.592E6
       GO TO 350
348    F2=3.1104E7
350    F1=F1/F2
       DO 355 M=1,L
       FLOWS(I,M)= FLOWS(I,M)*F1
355    CONTINUE
```

```
      GO TO 310
360   IF(IO3 .EQ. 1) GO TO 395
      WRITE(6,3050)
      WRITE(6,3055)
3050  FORMAT(///1H0,20X, 'KEY CODE-'/25X, 'FLOW UNIT KEY' /33X,
     2 '0 = CFS' /33X, '1 = AC. FT.')
3055  FORMAT(1H0,20X, 'TIME UNIT KEY' /33X,
     1                         '0 = SECONDS'/33X, '1 = DAY'/33X, '2 = WEE
     3K'  /33X, '3 = MONTH'/33X, '4 = YEAR')
      GO TO 395
390   WRITE(6,3100) I,J,K,L, (Q(M),M=1,12)
      IERR=1
3100  FORMAT(1H0, '***DATA READ ERROR--IN SECTION 33333--TRIB CODE NO .G
     2T. 100' /1H , 5X, 'CARD IMAGE IS ',4I5,12F7.1)
      GO TO 310
395   IF(NTO .EQ. 0) GOTO 12
      DO 398 I=1,NTO
      J=ITOS(I)
      DO 398 K=1,52
      IF(FLOWS(J,K))398,398,396
396   FLOWS(J,K)=-FLOWS(J,K)
398   CONTINUE
C  ***
C  ***-----------------------------------------------------------------------
C  *** THIS SECTION READS THE FLOW RATE--QUALITY DATA (ST. 410).  I = TRIB. NO.,
C  *** J = QUALITY FACTOR CODE, K = FLOW UNIT KEY, L = QUALITY UNIT KEY)
C  *** THE FLOWRATE AND QUALITY ARE THEN READ IN PAIRS,  AT LEAST TWO PAIRS
C  *** MUST BE GIVEN.  THE PROGRAM INTERPOLATES  TO FIND THE NEEDED FLOW.
C  ***-----------------------------------------------------------------------
C  ***
400   IF(IO4 .EQ. 1) GO TO 410
      WRITE(6,1090)TITLE
      WRITE(6,4010)
4010  FORMAT(1H0,15X, 'TRIBUTARY WATER QUALITY DATA')
      WRITE(6,4020)
4020  FORMAT(1H0, 5X, 'TRIB  QUALITY  FLOW UNIT  QUAL UNIT    POINTS' /
     2 6X,'NO.    F.C.      KEY         KEY',5X,'FLOW  QUALITY')
410   READ(5,4030) I,J,K,L, (Q(M),M=1,10)
4030  FORMAT(4I5,10F5.0)
      F1=1.
      F2=1.
      IF(I .GT. 11110) GO TO 450
      IF(I .GT. 100 .OR. J .GT. 12) GO TO 490
      IF(IO4 .EQ. 1) GOTO 430
      WRITE(6,4040) I, J, K, L, Q(1), Q(2)
4040  FORMAT(1H0, 3X,I5,I7,I10,I11, 1X,   2F9.3)
      DO 420 M=3,7,2
      IF(Q(M))420,430,420
420   WRITE(6,4042) Q(M), Q(M+1)
4042  FORMAT(38X, 2F9.3)
430   IF(K .EQ. 1) F1=.0168
      IF(L .EQ. 1) F2=.000736
      DO 440 M=1,7,2
```

```
           QF(I,J,M) = Q(M)*F1
     440   QF(I,J,M+1) = Q(M+1)*F2
           GO TO 410
     450   IF(IO4 .EQ. 1) GO TO 12
           WRITE(6,4050)
     4050  FORMAT(///1H0, 20X, 'KEY CODE-'/25X, 'QUALITY FACTOR CODE'/35X,
          2'1 = TDS' /35X, '2 = NA' /35X,'3 = CA' /35X, '4 = MG'/ 35X, '5 = K
          3' /35X, '6 = CL' /35X, '7 = HCO3' /35X, '8 = SO4' /35X '9 = NO3' /
          4 34X '10 = PO4' /34X '11 = F')
           WRITE(6,4060)
           WRITE(6,4065)
     4060  FORMAT( 1H0,24X, 'FLOW UNIT KEY' /35X,
          1                               '0 = CFS' /35X '1 = AC. FT./MO' )
     4065  FORMAT(1H0, 24X,
          2 'QUALITY UNIT KEY' /35X '0 = MG/L' /35X '1 = TON/AF')
           GO TO 12
     490   WRITE (6,4100) I,J,K,L, (Q(M),M=1,10)
     4100  FORMAT(1H0, '***DATA READ ERROR--IN SECTION 44444--TRIB OR QUAL FAC
          2CTOR CODE TOO LARGE' /1H0, 5X, 'CARD IMAGE IS ',4I5,10F9.3)
           IERR=1
           GO TO 410
     C  ***
     C  ***---------------------------------------------------------------------
     C  *** THIS SECTION READS THE PRECIPITATION DATA (ST. 510))  I = AREA CODE,
     C  *** J = PREC. UNIT KEY, K = TIME BASE KEY, L = REPEAT KEY.
     C  ***---------------------------------------------------------------------
     C  ***
     500   IF (IO5.EQ.1) GOTO 510
           WRITE(6,1090)TITLE
           WRITE (6,5010)
     5010  FORMAT (1H0,15X,'PRECIPITATION DATA')
           WRITE(6,5020)
     5020  FORMAT (1H0,5X,'BAY  PRECIP UNIT  TIME BASE  REPEAT   '   /
          11H ,5X,'NO.      KEY          KEY       KEY   PERIOD  PRECIP' )
     510   READ(5,5030)I,J,K,L,(Q(M),M=1,12)
           IF (I.GT.11110)GOTO 560
           IF (I.GT.10)GOTO 590
           F1 =.0833
           F2=1.
            N=12
           IM=1
           IF(J.EQ.1)F1= 1.
           IF (K.EQ.0)GOTO 518
           GOTO (512,514,518,516),K
     512   F2=30.41
           GO TO 517
     514   F2=4.33
           GO TO 517
     516   F2=.0833
     517   F1=F1*F2
     5030  FORMAT (4I5,12F5.0)
     5035   FORMAT(16F5.0)
     518   DO 520 M=IM,N
```

```
              PREC(I,M) = Q(M)*F1
              IF (Q(M).LT.0.0)GOTO 525
              M1=M+1
       520    CONTINUE
              IM=N+1
              N=N+16
              READ(5,5035)(Q(M),M=M1,N)
              GO TO 510
       525    M=M-1
              IF(I05 .NE. 1) WRITE(6,5040) I,J,K,L,(N,Q(N),N=1,M)
       5040   FORMAT(1H ,I7, 5X, I4, 8X, I4, I10, 3X,  100( I5 ,F9.3,/42X))
       530    IF(L .NE. 0)GOTO 510
              DO 535 J=1,12
              J1=J+12
              J2=J+24
              J3 =J+36
              P=PREC(I,J)
              PREC(I,J1) = P
              PREC(I,J2) = P
              PREC(I,J3) = P
       535    CONTINUE
              GO TO 510
       560    IF(I05.EQ.1)GOTO 12
              WRITE (6,5060)
       5060    FORMAT(///1H0,20X,'KEY CODE-',/25X,
             2 'PRECIP UNIT KEY' /33X, '0 = IN.' /33X, '1 = FT.')
              WRITE(6,5065)
       5065   FORMAT(1H0,24X, 'TIME UNIT KEY' /33X, '0 = MONTH', /33X,
             2 '1 = DAY' /33X, '2 = WEEK' /33X '3 = MONTH' /33X,
             3'4 = YEAR')
              GO TO 12
       590    WRITE(6,5100)I,J,K,L,(Q(M),M=1,12)
       5100    FORMAT(1H0,'***DATA READ ERROR--IN SECTION 55555--BAY CODE NO. ,G
             2T. 10'/
             3I4 ,5X, 'CARD IMAGE IS-',4I5,12F7.1)
              GOTO 510
       C  ***
       C  ***------------------------------------------------------------------
       C  *** THIS SECTION READS THE EVAPORATION DATA AS FOR PRECIP, ABOVE.
       C  ***------------------------------------------------------------------
       C  ***
       600    IF(I06 .EQ. 1)GOTO 610
              WRITE(6,1090) TITLE
              WRITE(6,6010)
       6010   FORMAT(1H0, 15X, 'EVAPORATION DATA')
              WRITE(6,6020)
       6020   FORMAT(1H0, 5X, 'BAY   EVAP UNIT    TIME BASE   REPEAT'/6X'NO',7X,
             2 'KEY',9X, 'KEY', 7X, 'KEY    PERIOD  EVAPORATION')
       610    READ(5,5030) I,J,K,L, (Q(M),M=1,12)
              IF(I .GT. 11110)GO TO 660
              IF(I .GT. 10) GO TO 690
              F1=.0833
              F2=1.
```

```
        N=12
        IM=1
        IF(J .EQ. 1) F1=1.
        IF(K.EQ. 0) GO TO 618
        GO TO (612,614,618,616),K
612     F2=30.41
        GO TO 617
614     F2=4.33
        GO TO 617
616     F2=.0833
617     F1=F1*F2
618     DO 620 M=IM,N
        EVAP(I,M) = Q(M)*F1
        IF(Q(M) .LT. 0.) GO TO 625
        M1=M+1
620     CONTINUE
        IM=N+1
        N=N+16
        READ(5,5035)(Q(M),M=M1,N)
        GO TO 618
625     M=M-1
        IF(IO6 .NE. 1) WRITE(6,5040) I,J,K,L,(N,Q(N),N=1,M)
630     IF(L .NE. 0) GO TO 610
        DO 635 J=1,12
        J1=J+12
        J2=J+24
        J3=J+36
        E = EVAP(I,J)
        EVAP(I,J1) = E
        EVAP(I,J2) = E
        EVAP(I,J3) = E
635     CONTINUE
        GO TO 610
660     IF(IO6 .EQ. 1) GO TO 12
        WRITE(6,6060)
6060    FORMAT(///1H0,20X, 'KEY CODE-' /25X,'EVAPORATION UNIT KEY',/33X,
       2'0 = IN.' /33X, '1 = FT.')
        WRITE(6,5265)
        GO TO 12
690     WRITE(6,6100) I,J,K,L,(Q(M),M=1,12)
6100    FORMAT(1H0, '***DATA READ ERROR--IN SECTION 66666--BAY NO. .GT. 10' /5X
       2 ' /5X, 'CARD IMAGE IS-',4I5,12F7.1)
        GO TO 610
C   ***
C   ***--------------------------------------------------------------------
C   *** THIS SECTION READS THE STAGE, AREA, VOLUME DATA. (ST. 710).
C   *** I = AREA CODE, J = UNIT CODE.  AREA 11 IS THE ENTIRE LAKE SYSTEM.
C   *** IF ANY BAYS ARE DIKED THE AREA AND VOLUME OF THE DIKED AREA ARE
C   *** AUTOMATICALLY REMOVED BY STATEMENTS 9010 TO 8200 BELOW.
C   ***--------------------------------------------------------------------
C   ***
700      IF(IO7.EQ.1)GOTO 710
        WRITE(6,1090)TITLE
        WRITE(6,7010)
7010    FORMAT(1H0,15X,'STAGE - AREA - VOLUME'  )
       WRITE (6,7020)
7020    FORMAT(1H0,5X,'BAY   STAGE       AREA        VOLUME'
      2/6X'NO     FT          ACRES        AC.FT.')
710     READ(5,7030)I,J,(Q(M),M=1,7)
7030   FORMAT(2I5, 7F10.0)
       IF(I .GT. 30011) GOTO 770
       READ(5,7035)(Q(M),M=8,15)
7035   FORMAT(8F10.0)
        F1=1.
        IF(I.GT.20011)GOTO 750
        IF(I.GT.10011)GOTO 730
        I=I-10000
        IF(J.EQ.1)F1=12.
        DO 720 M=1,15
720     STAGE(M) = Q(M)/F1
       GOTO 710
730     I=I-20000
        IF(J.EQ.1)F1=43560.
        DO 740 M=1,15
        AREA(I,M)=Q(M)/F1
       IF(Q(M) .EQ. 0.) AREA(I,M)=.1
740    CONTINUE
       GOTO 710
750     I=I-30000
       IF(J .EQ.1)F1=43560.
       DO 760 M=1,15
760    VOL(I,M)=Q(M)/F1
        GOTO 710
770     IF(IO7.EQ.1)GOTO 12
       DO 790 J=1,11
       IF(AREA(J,2).LE.0.) GO TO 790
        WRITE(6,7060)
7060    FORMAT(1H0)
       DO 780 M=1,15
775     WRITE(6,7070)J,STAGE(M),   AREA(J,M), VOL(J,M)
7070   FORMAT(1H ,2X,I4,F11.2,2F12.2)
780    CONTINUE
790    CONTINUE
       GO TO 12
900    WRITE(6,9010)
9010    FORMAT(/1H0,'***ALL DATA HAS BEEN READ IN')
C  ***
C  ***---------------------------------------------------------- ---------
C  ***
C  *** THE FOLLOWING  SECTION ACCOUNTS FOR DIKING BY DECREASING THE TOTAL LAKE
C  *** AREA AND VOLUME BY THE BAY VALUES--SPECIFIED TRIBS ARE ASSIGNED TO
C  *** OTHER BAYS AS DESINED.  THE DIKED BAYS ARE CARRIED ALONG AS SEPERATE BAYS
C  ***
C  ***-------------------------------------------------------------------
C  ***
       NX=NBAYS+1
      DO 820 II=2,NX
      I=IBAYS(II)
      IF(NMD(I) .NE. 1) GOTO 820
      DO 810 L=1,15
      AREA(11,L)=AREA(11,L) - AREA(I,L)
      VOL(11,L) = VOL(11,L) - VOL(I,L)
810   CONTINUE
      WRITE(6,8200) I
820   CONTINUE
8200  FORMAT(1H0, 5X, 'THE TOTAL LAKE AREA AND VOLUME HAVE BEEN REDUCED BY THE
     2BY THE VALUES FOR DIKED BAY', I3)
C  ***
C  ***------------------------------------------------------------------
C  *** THE FOLLOWING SECTION IDENTIFIEDS DIKED BAYS AND REASSIGNS THE SPECIFIED
C  *** TRIBS TO THE BAY LISTED IN THE ARRAY IBTA.
C  ***------------------------------------------------------------------
C  ***
      DO 860 II=1,NBAYS
      I=IBAYS(II)
C  *** IF NBD CONTAINS 1 THEN THE BAY IS DIKED
      IF(NMD(I) .NE. 1) GOTO 860
      J=IBTA(I)
      NN=NTRIB(J)
      LL=ITNA(1,I)
      NTRIB(J)=NN+LL
      DO 850 L=1,LL
      NNN=NN+L
      ITBAY(J,NNN)  = ITNA(I,L)
      KK= NTRIB(I)
      DO 842 K=1,KK
      IF(ITNA(I,L) .NE. ITBAY(I,K)) GOTO 842
      ITBAY(1,K) = ITBAY(I,KK)
      NTRIB(I) = KK-1
      GO TO 850
842   CONTINUE
850   CONTINUE
      WRITE(6,8510) I, J, (ITNA(I,L),L=1,LL)
8510  FORMAT(1H0, 5X, '***TRIBS FROM DIKED BAY', I3, ' THAT HAVE BEEN AS
     2SSIGNED TO BAY',I3, ' THEY ARE',/, 20X, 30I3)
      N=NTRIB(I)
      IF(N .EQ. 0) GOTO 860
      WRITE(6,8220) I, (ITBAY(I,L),L=1,N)
8220  FORMAT(1H0, 5X, 'DIKED BAY', I3, ' HAS THE FOLLOWING TRIBS REMAININ
     2NG' , 30I3)
860   CONTINUE
C  ***
C  ***------------------------------------------------------------------
C  ***------------------------------------------------------------------
C  *** THE FOLLOWING STATEMENTS CHANGE THE FLOWRATES (FQ), PRECIPITATION (FP)
C  *** AND EVAPORATION (FE) BY THE FACTOR GIVEN IN THE DATA.
C  ***------------------------------------------------------------------
C  ***
      IF(FQ.EQ.1. .AND. FP.EQ.1. .AND. FE.EQ.1.) GOTO 940
      IF(FQ.EQ.0. .AND. FP.EQ.0. .AND. FE.EQ.0.) GOTO 940
      DO 930 II=1,NBAYS
      J=IBAYS(II+1)
      DO 920 I=1,NINT
      PREC(J,I)=PREC(J,I)*FP
      EVAP(J,I)=EVAP(J,I)*FE
      IF(FQ.EQ.1.)GOTO 920
      N=NTRIB(J)
      DO 910 LL=1,N
      L=ITBAY(J,LL)
      DO 910  K=1,NINT
      FLOWS(L,K)=FLOWS(L,K)*FQ
910   CONTINUE
920   CONTINUE
930   CONTINUE
      WRITE(6,9110) FP, FE, FQ
9110  FORMAT(1H0, 5X, 'THE PRECIP, EVAP, AND FLOWRATES HAVE BEEN MULTIPL
     2IED BY THE FOLLOWING FACTORS',/, 10X, 'PRECIP FACTOR=', F5.2,/
     3 ,10X, 'EVAP  FACTOR =', F5.2, /, 10X, 'FLOW  FACTOR =',F5.2)
940   CONTINUE
C  ***
C  ***-------------------------------------------------------------------
C  *** THE FOLLOWING STATEMENTS CHANGE THE MAGNITUDE OF TRIB FLOWS FOR
C  *** TRIBS IN ITC, IF ANY.
C  ***-------------------------------------------------------------------
C  ***
      IF(NTC .EQ. 0) GO TO 980
      DO 970 II=1,NTC
      K=ITC(II)
      F=FTC(II)
      DO 960 I=1,NINT
960   FLOWS(K,I) = FLOWS(K,I) * F
      WRITE(6,9600) K,F
9600  FORMAT(1H0, 5X, 'FLOWRATES FOR TRIB',I3, '  HAVE BEEN MULTIPLIED B
     2Y FACTOR',F7.3)
970   CONTINUE
980   CONTINUE
      DO 990 I=1,60
      DO 990 J=1,12
990   BGS(I,J) = COFIN(I,J)
C  ***
C  ***-------------------------------------------------------------------
C  *** WHEN IT2 = 1 THEN THE DATA AS SET UP FOR SIMULATION IS WRITTEN TO TAPE
C  ***-------------------------------------------------------------------
C  ***
      IF(IT2 .EQ. 1)CALL TAPE(2)
      IF(IT2 .EQ. 1) WRITE(6,9910)
9910  FORMAT(1H0, 5X, '***WARNING-- THE DATA WRITTEN TO TAPE HAS HAD ALL OF THE
     2 OF THE CHANGES INDICATED ABOVE MADE TO IT')
       RETURN
      WRITE(6,1090)TITLE
       END
       $
      SUBROUTINE COW
C  ***
C  ***---------------------------------------------------------------------
C  *** THIS SUBROUTINE COMBINES THE TIME PERIOD INFLOW, PRECIPITATION
C  *** AND EVAPORATION TO DETERMINE A NET FLOW BETWEEN THE MAIN LAKE AND
C  *** THE SATELLITE BAYS. THE BAY CODE NUMBERS ARE STORED IN THE ARRAY
C  *** IBAY IN THE ORDER TO BE CONSIDERED.  IBAY(1) CONTAINS 11--THE CODE
C  *** FOR THE ENTIRE LAKE, IBAY(2) IS THE MAIN LAKE, IBAY(3), . .CONTAIN
C  *** THE CODE NUMBERS FOR THE SATELLITE BAYS TO THE MAIN LAKE.
C  ***
C  *** ANY WATER OVERFLOWING OUT OF THE SYSTEM OR FLOWING INTO A
C  *** SATELLITE BAY IS REMOVED BEFORE THE FINAL END-OF-PERIOD QUALITY
C  *** OF THE MAIN LAKE IS DETERMINED.
C  *** WHEN KEY=0 SUBR SAV RETURNS THE VOLUME AND AREA OF ALL THE BODIES FOR THE
C  *** THE BEGINNING STAGE.
C  ***---------------------------------------------------------------------
C  ***
        COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
      2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
      3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
      4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
      5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
      6 TTF(60), TTS(62,12), ITOS(7),
      7 NIONS, NOBD, INT , NINT, NBAYS, IT1, IT2, TP, TE, TQ, IBOF, SOF,
      8 VOLOF, BVDS, QOF, FT, VOFS, IO1, TIMEF
        COMMON /STVL/    A(11), V(11), VT(11), P(11), E(11)
        TP=0.
        TE=0.
        TQ=0.
C  *** DETERMINE THE INFLOW, PRECIP, AND EVAP FOR EACH BODY AND THE
C  *** RESULTING QUALITY AFTER MIXING IN EACH OF THE BODIES BEFORE INTERMIXING
        NX=NBAYS+1
        IF(IO1 .EQ. 1) WRITE(6,200) INT
200     FORMAT(// 1H0, 10X, '***TRIB. FLOW AND QUALITY DATA USED FOR PERIO
      2D', I3,//, '    BAY  TRIB.  FLOW-ACFT   I O N   C O N C --MG/L')
        DO 30 II=2,NX
        I=IBAYS(II)
        N=NTRIB(I)
        Q(I)=0.
        VT(I)=0.
        DO 20 JJ=1,N
        J=ITBAY(I,JJ)
        F1=FLOWS(J,INT)
        F=F1*59.5041 * TIMEF
        TTF(J) = TTF(J) + F
        Q(I)=Q(I)+F
        DO 10 KK=1,NIONS
        K=IONS(KK)
        IF(F1) 4,10,6
4       IF(QOF) 6,6,5
5       QUA= COFIN(I,K) *F
        IF(NBD(I) .EQ. 1) GOTO 9
        TOTSO(K) = TOTSO(K) - QUA
        GOTO 9
 6      QUA =QUALF(J,K,F1,KK) * F
        IF(NBD(I) .EQ. 1)GOTO 9
        IF(F1) 7,7,8
 7      TOTSO(K) = TOTSO(K) - QUA
        GOTO 9
 8      TOTSI(K)=TOTSI(K) + QUA
 9      SALTS(K)=SALTS(K) + QUA
        IF(J .EQ.53)  QUA = -QUA
        TTS(J,K) = TTS(J,K) + QUA
        BMF(1,K) = QUA/F
 10     CONTINUE
        IF(J .NE. 53) FT = FT+F
        IF(IOI .EQ. 1) WRITE(6,210) I, J, F, (BMF(1,K),K=1,NIONS)
 210    FORMAT( 1H , I6, I6, F12.1, 12F8.2)
 20     CONTINUE
        VT(I)=Q(I)
        VS=V(I)
        P(I)= PRECF(I) * A(I) * TIMEF
        E(I)= EVAPF(I) * A(I) * TIMEF
        V(I)=V(I) + P(I) + Q(I) - E(I)
        TE=TE+E(I)
        TP=TP+P(I)
        TQ=TQ+Q(I)
        DO 25 KK=1,NIONS
        K=IONS(KK)
        CQFIN(I,K)=(VS*CQFIN(I,K) + SALTS(K)) / V(I)
        SALTS(K)=0.
 25     CONTINUE
 30     CONTINUE
 C  *** COMPUTE BAY INTERFLOW VOLUMES AND FINAL QUALITY AT THE END OF PERIOD
        Q1=V(1)
        DO 35 II=1,NX
        I=IBAYS(II)
 35     Q(I)=V(I)
 C  *** WHEN KEY=1 SUBR SAV RETURNS THE DELTA VOLUME IN EACH BAY TO ALLOW
 C  *** THE LAKE TO REACH THE SAME STAGE THROUGHOUT.
        CALL SAV(1)
        IX=IBAYS(2)
        DO 80 II=3,NX
        I=IBAYS(II)
        IF(I .EQ. IBOF) GOTO 40
        IF(NBD(I) .EQ. 1) GOTO 80
 40     D=DELV(I)
        V(I)=Q(I)-D
        IF(D)50,80,65
 C  *** FLOW INTO THE BAY--- QUALITY
 50     DO 55 KK=1,NIONS
        K=IONS(KK)
        CQFIN(I,K)=(CQFIN(I,K)*Q(I)+ CQFIN(IX,K)*(-D))/ V(I)
 55     CONTINUE
        Q(IX)=Q(IX) + D
        GO TO 75
```

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C  *** FLOW INTO THE LAKE--- QUALITY
65     DO 70 KK=1,NIONS
       K=IONS(KK)
       SALTS(K)=SALTS(K) + D*COFIN(I,K)
70     CONTINUE
75     V(IX) = V(IX) + D
80     CONTINUE
C  ** NOW CALC FINAL WATER QUALITY IN THE MAIN LAKE AT THE END OF THE PERIOD
       DO 90 KK=1,NIONS
       K=IONS(KK)
       COFIN(IX,K)=(COFIN(IX,K)*Q(IX) + SALTS(K)) / V(IX)
       SALTS(K)=0.
90     CONTINUE
       Q(1)=Q1
C  ***
C  *** THE STATEMENTS FROM HERE TO 105 ALLOW FOR THE EXCHANGE OF BAY AND
C  *** MAIN LAKE WATER DUE TO CIRCULATION IF SPECIFIED
C  *** BMF IS THE FRACTION OF THE FINAL BAY VOLUME THAT IS EXCHANGED
C  *** WITH THE MAIN LAKE DUE TO CIRCULATION
C  ***
       IXX=0
       DO 95 II=3,NX
       I=IBAYS(II)
       IF(INMIX(I) .NE. 1) GOTO 95
       IF(NBD(I) .EQ. 1) GOTO 95
       IF(BMF(I,INT)) 95,95,92
92     IXX=1
       B1=BMF(I,INT)
       B2=1.-B1
       WRITE(6,950) I, B1, INT
950    FORMAT(1H0, 5X, '*** THE INTERMIXING FRACTION FOR BAY',I3, ' IS',
      2 F7.3, ' FOR TIME PERIOD', I3)
       DO 95 KK=1,NIONS
       K=IONS(KK)
       C1=COFIN(IX,K)
       C2=COFIN(I,K)
       COFIN(I,K)=C1*B1 + C2*B2
C  *** THE NET MASS INTO THE LAKE FROM THIS BAY ARE (PLUS PREVIOUS FROM
C  *** OTHER BAYS IF ANY)---
       SALTS(K)=SALTS(K) + V(I)*B1*(C2-C1)
95     CONTINUE
100    CONTINUE
       IF(IXX .EQ. 0)GOTO 110
       DO 105 KK=1,NIONS
       K=IONS(KK)
       COFIN(IX,K)= COFIN(IX,K) + SALTS(K)/V(IX)
105    SALTS(K)=0.
110    CONTINUE
       RETURN
       END
       S
```

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SUBROUTINE PLOTHS(N,  VS)
C   ***
C   ***----------------------------------------------------------------------
C   *** THE PLOT RUUTINE MUST BE SET UP FOR THE PLOT AVAILABLE ON THE
C   *** COMPUTER BEING USED -- THIS IS INCLUDED AS AN EXAMPLE OF PLOT SYSTEMS
C   ***
C   *** PLOTHS STORES THE QUALITY AT THE END OF EACH TIME PERIOD AND
C   *** THEN PLOTS THE RESULTS AT THE END OF THE SIMULATION,
C   ***----------------------------------------------------------------------
C   ***
      COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
     2 OF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
     3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
     4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
     5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
     6 ITF(60), TTS(60,12), ITOS(7),
     7 NIONS, NORD, INT ,   NI, NBAYS, IT1, IT2, TP, TE, TO, IBOF, SOF,
     8 VOLOF, BVOB, QOF, FT, VOFS, IO1, TIMEF
      DIMENSION DSL(48), USP(48), DSG(48), XNAL(48), XNAP(48), XNAG(48),
     2 CAL(48), CAP(48), CAG(48),  XMGL(48), XMGP(48), XMGG(48),
     3 XKL(48), XKP(48), XKG(48),  CLL(48), CLP(48), CLG(48),
     4 HCO3L(48), HCO3P(48), HCO3G(48),  SO4L(48), SO4P(48), SO4G(48),
     5XNO3L(48), XNO3P(48), XNO3G(48), PO4L(48), PO4P(48), PO4G(48),
     5 FL(48), FP(48), FG(48),
     6 TOTVOL(48),           XM(48), NAME1(6), NAME2(6), NAME3(6),
     7 NAME4(6), NAMES(6), NAME6(6), NAME7(6), NAME8(6), NAME9(6),
     8 NAME10(6), NAME11(6), NAME12(6), NAME13(6),ALT1(48),ALT2(48),
     9 ALT3(48)
      DATA NAME1 /'DISS','ULVE','D SO','LIDS','-MG/','L   '/,
     2 NAME2 /'SODI','UM I','ON  ','--MG','/L  ','    '/ ,
     3 NAME3 /'CALC','IUM ','ION ','--MG','/L  ','    '/ ,
     4 NAME4 /'MAGN','ESIU','M IO','N  -','MG/','L   '/ ,
     5 NAMES /'POTA','SSIU','M IO','N  -','-MG/','L   '/ ,
     6 NAME6 /'CHLO','RIDE',' ION','--M','G/L ',' '/,
     7 NAME7 /'BICA','RBON','ATE ','AS C','ACO3','-MGL'/ ,
     8 NAME8 /'SULF','ATE ','ION ','--MG','/L  ',' '/,
     9 NAME9 /'NITR','ATE ','CONC',' AS ','N--M','G/L '/ ,
     X NAME10 /'PHOS','PHAT','E AS',' P  ','--MG','/L'/  ,
     9 NAME12 /'LAKE',' LEV','EL  ','IN F','EET ','-MSL'/,
     XNAME13 /'TOTA','L LA', 'KE V','OLUM','E--A','C-FT'/
      DSL(N)  = COFIN(1,1)
      DSP(N)  = COFIN(2,1)
      DSG(N)  = COFIN(3,1)
      XNAL(N) = COFIN(1,2)
      XNAP(N) = COFIN(2,2)
      XNAG(N) = COFIN(3,2)
       CAL(N) = COFIN(1,3)
       CAP(N) = COFIN(2,3)
       CAG(N) = COFIN(3,3)
      XMGL(N) = COFIN(1,4)
      XMGP(N) = COFIN(2,4)
      XMGG(N) = COFIN(3,4)
       XKL(N) = COFIN(1,5)
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        XKP(N) = COFIN(2,5)
        XKG(N) = COFIN(3,5)
       CLL(N)  = COFIN(1,6)
       CLP(N)  = COFIN(2,6)
       CLG(N)  = COFIN(3,6)
       HCO3L(N)= COFIN(1,7)
       HCO3P(N)= COFIN(2,7)
       HCO3G(N)= COFIN(3,7)
       SO4L(N) = COFIN(1,8)
       SO4P(N) = COFIN(2,8)
       SO4G(N) = COFIN(3,8)
       XNO3L(N)= COFIN(1,9)
       XNO3P(N)= COFIN(2,9)
       XNO3G(N)= COFIN(3,9)
        PO4L(N)= COFIN(1,10)
        PO4P(N)= COFIN(2,10)
        PO4G(N)= COFIN(3,10)
          FL(N)= COFIN(1,11)
          FP(N)= COFIN(2,11)
          FG(N)= COFIN(3,11)
       ALT1(N) = S(1)
       ALT2(N)=S(2)
       ALT3(N) = S(3)
       TOTVOL(N) = VS
       XM(N) = N
       IF(N .EQ.(NI+1))GO TO 10
       RETURN
10     WRITE(6,20)
       DO 15 II=1,NIONS
       I=IONS(II)
15     IT(I)=999
       NINT=NI+1
20     FORMAT(1H1)
25     FORMAT(1H , 60X,'LEGEND-- MAIN LAKE  AAAAA',/,70X, 'PROVO BAY  BBB
      2BB',/,70X, 'GOSHEN BAY CCCCC '  )
       M=2*N
       NH=45
       IF(DSG(N) .GT. 1900.) NH=111
       IF(IT(1) .NE. 999) GOTO 40
       CALL XYPLTX(1.,.5,0.,40.)
       CALL XYPLOT(N,NH,M,606,XM,DSL,DSP,DSG)
       WRITE(6,30) NAME1
30     FORMAT(1H0, 30X, 6A4)
       WRITE(6,25)
       WRITE(6,200) TITLE
200    FORMAT(1H ,10X, 15A4)
       WRITE(6,20)
40     IF(IT(2) .NE. 999) GOTO 50
       CALL XYPLTX(1.,.5,0.,5.)
       CALL XYPLOT(N,NH,M,606,XM,XNAL,XNAP,XNAG)
       WRITE(6,30) NAME2
       WRITE(6,25)
       WRITE(6,200) TITLE
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        WRITE(6,20)
 50     IF(IT(3) .NE. 999) GOTO 60
        CALL XYPLTX(1.,.5,0., 3.)
        CALL XYPLOT(N,NH,M,606,XM,CAL,CAP,CAG)
        WRITE(6,30) NAME3
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 60     IF(IT(4) .NE. 999) GOTO 70
        CALL XYPLTX(1.,.5,0., 3.)
        CALL XYPLOT(N,NH,M,606,XM,XMGL,XMGP,XMGG)
        WRITE(6,30) NAME4
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 70     IF(IT(5) .NE. 999)  GOTO 80
        CALL XYPLTX(1.,.5,0.,1.)
        CALL XYPLOT(N,NH,M,606,XM,XKL,XKP,XKG)
        WRITE(6,30) NAME5
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 80     IF(IT(6) .NE. 999) GOTO 90
        CALL XYPLTX(1.,.5,0.,10.)
        CALL XYPLOT(N,NH,M,606,XM,CLL,CLP,CLG)
        WRITE(6,30) NAME6
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 90     IF(IT(7) .NE. 999) GOTO 100
        CALL XYPLTX(1.,.5,0.,10.)
        CALL XYPLOT(N,NH,M,606,XM,HCO3L,HCO3P,HCO3G)
        WRITE(6,30) NAME7
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 100    IF(IT(8) .NE. 999) GOTO 110
        CALL XYPLTX(1.,.5,0.,10.)
        CALL XYPLOT(N,NH,M,606,XM,SO4L,SO4P,SO4G)
        WRITE(6,30) NAME8
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 110    IF(IT(9) .NE. 999) GOTO 120
        CALL XYPLTX(1.,.5,0.,.1)
        CALL XYPLOT(N,NH,M,606,XM,XNO3L,XNO3P,XNO3G)
        WRITE(6,30) NAME9
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
 120    IF(IT(10) .NE. 999) GOTO 130
        CALL XYPLTX(1.,.5,0.,.10)
        CALL XYPLOT(N,NH,M,606,XM,PO4L,PO4P,PO4G)
        WRITE(6,30) NAME10
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
130     IF(IT(11) .NE. 999) GOTO 140
        CALL XYPLTX(1.,.5,0.,.2)
        CALL XYPLOT(N,NH,M,606,XM,FL,FP,FG)
        WRITE(6,30) NAME11
        WRITE(6,25)
        WRITE(6,200) TITLE
        WRITE(6,20)
140     CALL XYPLTX(1.,.5,400000.,15000.)
        CALL XYPLOT(N,50,M,606,XM,TOTVOL)
        WRITE(6,30) NAME13
        WRITE(6,200) TITLE
        WRITE(6,20)
        CALL XYPLTX(1.,.5,4482,.2)
        CALL XYPLOT(N,50,M,606,XM,ALT1,ALY2,ALT3)
        WRITE(6,30) NAME12
        WRITE(6,200) TITLE
        WRITE(6,20)
        RETURN
        END
        F
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        FUNCTION QUALF(J,K,F1,KK)
        C  ***
        C  ***----------------------------------------------------------------------
        C  *** QUALF RETURNS THE QUALITY OF TRIBUTARY J, QUALITY FACTOR K,
        C  *** AND FLOWRATE F.  LINEAR INTERPOLATION IS USED BETWEEN POINTS
        C  *** STORED IN THE ARRAY QF.
        C  ***----------------------------------------------------------------------
        C  ***
                COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
              2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
              3 VOL(11,15), PREC(10,52), EVAP(10,52), NBO(10), ITNA(10,30),
              4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
              5 INMIX(10), RMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
              6 TTF(60), TTS(60,12), ITOS(7),
              7 NIONS, NOBO, INT , NINT, NBAYS, IT1, IT2, TP, TE, TO, IBOF, SOF,
              8 VOLOF, BVOB, OOF, FT, VOFS, IO1, TIMEF
        C  *** THIS SUBROUTINE DETERMINES THE QUALITY FOR TRIB J, QUALITY FACTOR K FROM
        C  *** THE TABLE OF WHICH CONTAINS FLOW-QUALITY PAIRS.
                DATA IX/0/
                F=F1
                IF(F1 .LT. 0.) F=-F
                DO 10 M=3,7,2
                IF(F-QF(J,K,M))20,20,9
        9       IF(QF(J,K,M))12,12,10
        10      CONTINUE
        12      IX=IX+1
                IF(IX .GT. 15) GOTO 15
                WRITE(6,100) J,K,F
        100     FORMAT( 1H ,'***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE
               2--TRIB=',I3, '   Q.F.=',I3, '  FLOW=',F8.2)
        15      QUALF=0.
                GO TO 30
        20      X= QF(J,K,M) - QF(J,K,M-2)
                IF(X .LT. 1.E-5) GOTO 15
                X=(F-QF(J,K,M-2)) / X
                QUALF        = QF(J,K,M-1) + X*(QF(J,K,M+1) - QF(J,K,M-1))
        30      RETURN
                END
                $
```

```
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        SUBROUTINE SAV(KEY)
        C  ***
        C  ***-------------------------------------------------------------------------
        C  *** SAV -- WHEN KEY=0 THE AREA AND VOLUME OF EACH BAY AND THE TOTAL
        C  *** LAKE ARE DETERMINED.  WHEN KEY=2 THE STAGE IS DETERMINED FOR THE
        C  *** TOTAL LAKE (BASED ON THE TOTAL VOLUME), THEN THE DELTA VOLUME
        C  *** (DELV) INTERFLOW BETWEEN THE MAIN LAKE AND EACH OF THE BAYS IS
        C  *** DETERMINED FOR EQUILIBRIUM (UNIFORM STAGE) THROUGHOUT THE SYSTEM.
        C  ***-------------------------------------------------------------------------
        C  ***
              COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
             2 QF( 60,12, 8), IONS(12), CUFIN(10,12), STAGE(15), AREA(11,15),
             3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
             4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
             5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
             6 TTF(60), TTS(60,12), ITOS(7),
             7 NIONS, NORD, INT , NINT, NBAYS, IT1, IT2, TP, TE, TQ, IBOF, BOF,
             8 VOLOF, BVOD, QOF, FT, VOFS, IO1, TIMEF
              COMMON /STVL/    A(11), V(11), VT(11), P(11), E(11)
              NX=NBAYS + 1
              IF(KEY .EQ. 1)GO TO 50
              DO 45 KK=1,NX
              L=IBAYS(KK)
              DO 20 J=2,15
              IF(S(L) - STAGE(J)) 30,30,20
        20    CONTINUE
              WRITE(6,100) S(L), L
        100   FORMAT(//1H ,'***TROUBLE--LAKE STAGE (',F10.2, ') NOT IN STAGE-AREA-
             2A-VOLUME TABLE--BAY',I3)
              STOP
        30    X = (S(L)-STAGE(J-1)) / (STAGE(J)-STAGE(J-1))
              A(L) = AREA(L,J-1) + X*(AREA(L,J)-AREA(L,J-1))
              V(L) = VOL(L,J-1) + X*(VOL(L,J)-VOL(L,J-1))
        45    CONTINUE
              RETURN
        50    V(11)=0.
              DO 55 I=2,NX
              L=IBAYS(I)
              DELV(L)=0.
              IF(NBD(L) .EQ. 1) GOTO 55
              V(11)=V(11) + V(L)
        55    CONTINUE
        C  *** INTERPOLATE TO GET POINT X IN TABLE FOR THE TOTAL LAKE AND DIKED BAYS
              DO 72 LL=1,NX
              L=IBAYS(LL)
              IF(L.NE.11 .AND. NBD(L).NE.1)GOTO 72
        56    DO 60 J=2,15
              IF(V(L)-VOL(L,J)) 65,65,60
        60    CONTINUE
              WRITE(6,110) V(L)
        110   FORMAT(/1H , '***TROUBLE--LAKE VOLUME CALCULATED--',F10.2, ' AC FT--LARGER
             2--LARGER THAN FOUND IN VOLUME TABLE')
              STOP
```

```
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        65      X= (V(L)-VOL(L,J-1)) /(VOL(L,J)-VOL(L,J-1))
                IF(L .NE. 11) GOTO 64
                X1=X
                J1=J
        64      S(L)=STAGE(J-1)+ X*(STAGE(J)-STAGE(J-1))
                A(L)= AREA(L,J-1) + X*(AREA(L,J) - AREA(L,J-1))
                IF(S(11) .LT. SOF+.02) GOTO 72
                IX=IBAYS(2)
                IF(IBOF) 67,67,66
        66      K=IBOF
                DELV(K) = VOLOF - V(11)
                DELV(IX) =-DELV(K)
                V(11) = VOLOF
                WRITE(6,120) K, DELV(IX), INT
        120     FORMAT(1H0, 5X, 'OVERFLOW FROM MAIN LAKE TO DIKED  BAY',I3, ' IS',
               2 F9.1,' AC FT DURING THIS PERIOD', I3)
                VOFS=VOFS - DELV(K)
                D= V(K) - DELV(K)
                DO 650 III=2,15
                IF(D - VOL(K,III)) 655,655,650
        650     CONTINUE
                WRITE(6,100) S(K),K
        655     X = (D - VOL(K,III-1))/ (VOL(K,III)-VOL(K,III-1))
                S(K) = STAGE (III-1) + X*(STAGE(III) - STAGE(III-1))
                A(K) = AREA(K,III-1) + X*(AREA(K,III) - AREA(K,III-1))
                D = -DELV(K)
                GOTO 69
        67      D = V(11) - VOLOF
                 V(11) = VOLOF
                WRITE(6,125) D
        125     FORMAT(1H0, 5X, 'OVERFLOW FROM THE  LAKE  THIS PERIOD IS', F9.1,
               2 'AC FT')
                VOFS=VOFS + D
                DELV(IX) = D
        69      DO 68 II=1,NIONS
                I=IONS(II)
        68      TOTSD(I) = TOTSD(I) + COFIN(IX,I)* DELV(IX)
                IC=1
                V(IX) = V(IX) - D
                Q(IX) = V(IX)
                GO TO 56
        72      CONTINUE
                X=X1
                DO 80 I=2,NX
                J=J1
                L=IBAYS(I)
                IF(NBD(L) .EQ. 1) GOTO 80
        C   *** DETERMINE THE INTERFLOW VOLUME FOR EACH BAY.  POSITIVE DELV MEANS
        C   *** FLOWS MUST LEAVE THE BAY FOR EQUILIBRIUM TO BE ACHIEVED.
                DELV(L) = DELV(L) + V(L) -(VOL(L,J-1) + X*(VOL(L,J)-VOL(L,J-1)))
                S(L)=S(11)
                A(L) = AREA(L,J-1) + X*(AREA(L,J) - AREA(L,J-1))
        80      CONTINUE
        90      RETURN
                END
                F
```

```
      FUNCTION PRECF(I)
C  ***
C  ***----------------------------------------------------------------------
C  *** PRECF RETURNS THE PRECIPITATION FALLING ON BAY I DURING TIME
C  *** PERIOD INT.
C  ***----------------------------------------------------------------------
C  ***
      COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
     2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
     3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
     4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
     5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
     6 TTF(60), TTS(60,12), ITOS(7),
     7 NIONS, NOBD, INT , NINT, NBAYS, IT1, IT2, TP, TE, TQ, IBOF, SOF,
     8 VOLOF, BVDB, QDF, FT, VOFS, IO1, TIMEF
      PRECF=PREC(I,INT)
      RETURN
      END
      F
```

```
      FUNCTION EVAPF(I)
C  ***
C  ***----------------------------------------------------------------------
C  *** EVAPF RETURNS THE EVAPORATION FROM BAY I DURING TIME PERIOD INT
C  ***----------------------------------------------------------------------
C  ***
      COMMON IT(20), Q(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
     2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
     3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
     4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
     5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
     6 TTF(60), TTS(60,12), ITOS(7),
     7 NIONS, NOBD, INT , NINT, NBAYS, IT1, IT2, TP, TE, TQ, IBOF, SOF,
     8 VOLOF, BVDB, QDF, FT, VOFS, IO1, TIMEF
      EVAPF=EVAP(I,INT)
      RETURN
      END
      S
```

```
        SUBROUTINE TAPE(IO)
        C  ***
        C  ***-----------------------------------------------------------------------
        C  *** THIS SUBR. WRITES AND READS THE INDICATED DATA FROM TAPE UNIT 1.
        C  ***-----------------------------------------------------------------------
        C  ***
              COMMON IT(20), G(50), ITBAY(10,50), NTRIB(10), FLOWS( 60,52),
             2 QF( 60,12, 8), IONS(12), COFIN(10,12), STAGE(15), AREA(11,15),
             3 VOL(11,15), PREC(10,52), EVAP(10,52), NBD(10), ITNA(10,30),
             4 IBAYS(11), SALTS(15), DELV(11), TITLE(15), NAMEB(11,2),
             5 INMIX(10), BMF(10,52), TOTSI(12), TOTSO(12) , S(11), IBTA(10),
             6 TTF(60), TTS(60,12), ITOS(7),
             7 NIONS, NORD, INT , NINT, NBAYS, IT1, IT2, TP, TE, TQ, IBOF, SOF,
             8 VOLOF, BVDB, OOF, FT, VOFS, IO1, TIMEF
              IF(IO .EQ. 1) GO TO 50
              REWIND 1
              DO 30 I=1,60
              WRITE(1)  I,(FLOWS(I,J),J=1,52)
              WRITE(1)  ((QF(I,J,K),J=1,12),K=1,10)
        30    CONTINUE
              WRITE(1)((PREC(I,J),I=1,5),J=1,50)
              WRITE(1)((PREC(I,J),I=6,10),J=1,50)
              WRITE(1)((EVAP(I,J),I=1,5),J=1,50)
              WRITE(1)((EVAP(I,J),I=6,10),J=1,50)
              WRITE(1) STAGE, AREA
              WRITE(1) VOL
              END FILE 1
              RETURN
        50    REWIND 1
              DO 60 L=1,60
               READ(1)  I,(FLOWS(I,J),J=1,52)
               READ(1)  ((QF(I,J,K),J=1,12),K=1,10)
        60    CONTINUE
               READ(1)((PREC(I,J),I=1,5),J=1,50)
               READ(1)((PREC(I,J),I=6,10),J=1,50)
               READ(1)((EVAP(I,J),I=1,5),J=1,50)
               READ(1)((EVAP(I,J),I=6,10),J=1,50)
               READ(1) STAGE, AREA
               READ(1) VOL
              RETURN
              END
```

ILLUSTRATIVE WATER QUALITY SIMULATIONS

System Simulated

A computer printout of the simulation of water quality in Utah Lake is included in the following pages. The simulation period is from July 1, 1970 to July 1, 1973. This simulation is included here to illustrate the necessary data input as described earlier, and to display the simulation results. Detailed descriptions of the Utah Lake setting, hydrology, and water quality, as well as discussions of these simulations, are found in the main report.

Simulation of "Natural" Lake Quality

This simulation is for the Utah Lake system as it existed during the July 1, 1970 to July 1, 1973 period. As discussed in the main report, extensive analyses of the measured data and several preliminary simulations were used to refine the estimates of mineral spring inflow quantity and lake evaporation necessary to achieve a reasonably good simulation of observed lake quality.

Data Listing -

A listing of the data cards required to run the simulation is given on pages 152 to 166 inclusive immediately following. Each line contains the data found on one data card. Interpretation of the data is possible by referring to the data coding instructions in the User's Guide presented earlier in this section.

Results of Simulation -

The complete computer printout of the results for the simulation is given on pages 167 to 234 inclusive.

```
11111
12111
UTAH LAKE --JULY 1970-JULY 1973--
   36
 4488.50


13111
   10    1    2    3    4    5    6    7    8    9   10
14111
    0
    1    1      900.
    1    2      140.
    1    3      50.
    1    4      55.
    1    5      20.
    1    6      180.
    1    7      230.
    1    8      190.
    1    9      .23
    1   10      1.9
    1   11      0.
    1   12      0.
    2    1      590.
    2    2      70.
    2    3      60.
    2    4      45.
    2    5      10.
    2    6              80.
    2    7      180.
    2    8      150.
    2    9      .15
    2   10      1.
    2   11      0.
    2   12      0.
    3    1      1050.
    3    2      180.
    3    3      55.
    3    4      55.
    3    5      24.
    3    6      300.
    3    7      190.
    3    8      265.
    3    9      .2
    3   10      .23
    3   11      0.
    3   12      0.
16111
    3    1    2    3
MAIN LK PROVO B GOSHEN B
17111
    2   36 .005.005 .005 .005 .002  .002 .002 .002 .002 .005 .005 .005 .025 .005
 .005 .005 .002 .002 .002 .002 .002 .005 .005 .005 .005 .025 .005 .005 .002 .002
 .002 .002 .002 .005 .005 .005-.01
    3   36 .15  .15  .15  .15  .1   .1   .1   .1   .1   .15  .15  .15  .15  .15
 .15  .15  .1   .1   .1   .1   .1   .15  .15  .15  .15  .15  .15  .15  .1   .1
 .1   .1   .1   .15  .15  .15 -.01
18111
              1    1
19111
```

```
    1.    1.    1.
88888
22222
    1    39     1     2     3     4     5     6     7     8     9    10    11    12    13    14
   15    16    17    18    19    20    21    22    23    24    25    26    27    28    29    48
   49    50    51    53    54    55    56    59    60
    2    17    31    32    33    34    35    36    37    38    39    40    41    42    43    44
   45    46    47
    3     3    52    57    58
88888
33333
    1    53
    1     1     3   3644,  33,   57,   26.  0.    0.    0.    0.    0.    17,   16,   3,
0.    4.    15.   10.   0.    0.    0.    0.    0.    0.    25.   8.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    2     1     3   3646.  25.   24.   45.   0.    0.    0.    0.    0.    0.    2.    19,
0.    5.    23.   0.    0.    0.    0.    0.    0.    0.    68.   1.    0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    3     1     3   360.   0.    0.    0.    0.    0.    0.    0.    0.    7.    59.   37.
0.    0.    0.    0.    0.    0.    0.    0.    49.   0.    0.    60.   0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    4     1     3   3624.  28.   23.   32.   30.   33.   33.   33.   34.   32.   34.   35.
38.   35.   22.   26.   31.   32.   31.   35.   30.   23.   33.   39.   0.    0.    0.    0.
 0.    2.    0.    0.    0.    0.    0.    0.
    5     1     3   3623.  13.   37.   7.    20.   16.   21.   30.   14.   18.   23.   67.
22.   2.    19.   15.   29.   0.    37.   21.   17.   12.   20.   32.   0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    6     1     3   36138, 126.  234.  69.   55.   67.   73.   66.   64.   73.   104.  146.
159.  115.  215.  63.   64.   70.   74.   63.   55.   68.   112.  146.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    7     1     3   3643.  62.   37.   40.   29.   34.   75.   47.   40.   81.   102.  65.
68.   79.   135.  194.  191.  97.   92.   58.   30.   57.   179.  74.   0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    8     1     3   36353. 117.  385.  436.  376.  383.  404.  314.  274.  316.  327.  392.
276.  93.   298.  328.  343.  310.  295.  230.  178.  214.  406.  351.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
    9     1     3   361287.678.  1240.1587.1642.1474.1519.1189.1207.1066.977.  1363.
1387.997.  1445.1558.1418.1311.1291.1104.1168.916.  375.  1154.1537.1168.1309.1875.
1666.1722.1596.1722.1968.1785.1107.1368.
   10     1     3   36207, 236.  275.  262.  213.  185.  191.  175.  181.  185.  240.  269.
215.  207.  220.  217.  204.  180.  178.  16.   213.  274.  325.  233.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
   11     1     3   36163. 129.  95.   83.   74.   74.   74.   76.   82.   80.   117.  215.
259.  141.  107.  76.   74.   77.   70.   66.   70.   92.   104.  164.  129.  124.  138.  143.
133.  135.  143.  130.  130.  140.  152.  150.
   12     1     3   3664.  56.   99.   80.   61.   54.   60.   47.   35.   61.   136.  154.
73.   96.   121.  114.  90.   72.   49.   38.   50.   100.  168.  178.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
   13     1     3   3658.  67.   65.   52.   44.   26.   23.   21.   23.   25.   69.   501.
63.   60.   58.   57.   58.   60.   61.   58.   68.   83.   105.  173.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
   14     1     3   36148, 163.  153.  155.  126.  109.  120.  102.  109.  128.  125.  226.
158.  231.  167.  159.  133.  114.  105.  89.   86.   121.  149.  168.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
   15     1     3   36157. 156.  153.  195.  174.  155.  156.  138.  156.  163.  191.  189.
123.  106.  158.  178.  163.  151.  129.  115.  121.  135.  150.  177.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
   16     1     3   36143. 73.   118.  119.  99.   93.   111.  111.  122.  124.  146.  152.
99.   103.  98.   115.  98.   94.   80.   71.   90.   83.   121.  114.  0.    0.    0.    0.
 0.    0.    0.    0.    0.    0.    0.    0.
```

```
   17    1    3   36401, 255, 356, 319, 222, 156, 158, 131, 139, 235, 368, 472,
348, 377, 428, 378, 249, 171, 141, 123, 117, 179, 375, 506,  0,   0,   0,   0,
 0,   0,   0,   0,   0,   0,   0,   0,
   18    1    3   361444,1569,2686,2442,2081,1866,2115,1725,1819,1974,1673,1519,
1374,1678,2693,2466,2020,1663,1654,1377,1353,1452,1150,1410,1599,1568,2410,2767,
2350,1875,1783,1845,2029,1577,1844,1785,
   19    1    3   361,   3,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
1,   3,   0,   0,   0,   0,   0,   0,   0,   6,   0,   0,   0,   0,   0,   0,
 0,   0,   0,   0,   0,   0,   0,   0,
   20    1    3   361842,2027,1849,1910,2170,2165,2196,1741,1910,2006,1910,1825,
1933,1980,2538,2266,2289,2440,2723,2377,2541,2509,2440,2313,1745,2372,2313,2593,
2602,2579,2782,2250,2271,2063,2265,2405,
   21    1    3   360,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,   0,
 0,   0,   0,   0,   0,   0,   0,   0,
   22    1    3   36 0,   0,   0,   3,   0,   0,   8,   6,   6,   4,   2,   0,
0,   0,   0,   0,   6,   6,   6,   6,   12,  30,  6,   0,   0,   0,   0,   0,
 0,   0,   0,   0,   0,   0,   0,   0,
   23    1    3   360,   0,   0,   0,   4,   6,   6,   6,   6,   6,   5,   2,
0,   0,   0,   0,   6,   6,   6,   6,   7,   7,   6,   1,   0,   0,   0,   0,
 0,   0,   0,   0,   0,   0,   0,   0,
   24    1    3   3612,  8,   11,  17,  20,  19,  22,  17,  16,  15,  13,  13,
10,  13,  11,  16,  21,  18,  16,  15,  16,  15,  15,  13,   0,   0,   0,   0,
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20     4         0.    31.  160. 31.
20     5         0.    18.  160. 18.
20     6         0.    64.  160. 64.
20     7         0.    275. 160. 275.
20     8         0.    191. 160. 191.
20     9         0.    37.  160. 37.
20    10         0.    .7   160. .7
21    20    0    0.    130. 18.  130.
21     3    0    0.    52.  1.   52.  9.   52.
21     4    0    0.    60.  1.   60.  9.   60.
21     5    0    0.    25.2 1.   25.2 9.   25.2
21     6         0.    105. 2.   105.
21     7    0    0.    300. 1.   300. 9.   300.
21     8         0.    78.  2.   78.
21     9    0    0.    .72  1.   .72  9.   .72
21    10    0    0.    .28  1.   .28  9.   .28
21     1         0.    600. 2.   600.
22     2         0.    30.  2.   30.
22     3         0.    70.  2.   70.
22     4         0.    46.  2.   46.
22     5         0.    27.  2.   27.
22     6         0.    21.  2.   21.
22     7         0.    355. 2.   355.
22     8         0.    78.  2.   78.
22     9         0.    .75  2.   .75
22    10         0.    .17  2.   .17
22     1         0.    600. 2.   600.
23     2         0.    30.  2.   30.
23     3         0.    70.  2.   70.
23     4         0.    46.  2.   46.
23     5         0.    27.  2.   27.
23     6         0.    21.  2.   21.
23     7         0.    355. 2.   355.
23     8         0.    78.  2.   78.
23     9         0.    .75  2.   .75
23    10         0.    .17  2.   .17
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23   1        0.   600. 2.   600.
24   2             24.  18.  24.
24   3    0   0.   90.  1.   90.  9.   90.
24   4    0   0.   42.  1.   42.  9.   42.
24   5    0   0.   42.  1.   42.  9.   42.
24   6             15.  18.  15.
24   7    0   0.   330. 1.   330. 9.   330.
24   8             40.  18.  40.
24   9    0   0.   .72  1.   .72  9.   .72
24   10   0   0.   .06  1.   .06  9.   .06
24   1             510. 18.  510.
25   2             36.  18.  36.
25   3    0   0.   68.  1.5  68.  9.   68.
25   4    0   0.   36.  1.5  36.  9.   36.
25   5    0   0.   16.2 1.5  16.2 9.   16.
25   6             27.  18.  27.
25   7    0   0.   435. 1.5  435. 9.   435.
25   8             78.  18.  78.
25   9    0   0.   .8   1.5  .8   9.   .8
25   10   0   0.   .16  1.5  .16  9.   .16
25   1             690. 18.  690.
26   2        0.   80.  9.   80.
26   3        0.   54.  9.   54.
26   4        0.   21.  9.   21.
26   5        0.   10.  9.   10.
26   6        0.   110. 9.   110.
26   7        0.   326. 9.   326.
26   8        0.   49.  9.   49.
26   9        0.   4.3  9.   4.3
26   10       0.   22.  9.   22.
26   1        0.   479. 9.   479.
27   2        0.   139. 50.  139.
27   3        0.   49.  50.  49.
27   4        0.   52.  50.  52.
27   5        0.   19.  50.  19.
27   6        0.   186. 50.  186.
27   7        0.   226. 50.  226.
27   8        0.   211. 50.  211.
27   9        0.   1.   50.  1.
27   10       0.   .4   50.  .4
27   1        0.   600. 50.  600.
28   2             26.  18.  26.  2.   26.
28   10   0   0.   .04  1.   .04  6.   .04
28   3    0   0.   102. 6.   102.
28   4    0   0.   23.  6.   23.
28   5    0   0.   4.5  6.   4.5
28   6             18.  18.  18.
28   7    0   0.   390. 6.   390.
28   8             114. 18.  114.
28   9    0   0.   1.02 6.   1.02
28   1             570. 18.  570.
29   2             12.  600. 12.  1000.12.
29   3    0   0.   60.  500. 60.  1000.60.
29   4    0   0.   16.  500. 16.  1000.16.
29   5    0   0.   3.   500. 3.   1000.3.
29   6        0.   18.  1000.18.
29   7    0   0.   180. 500. 180. 1000.180.
29   8             51.  600. 51.  1000.51.
29   9             .32  1000..32
29   10       0.   .12  1000..12
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30    3      0      0.    102. 1.   102. 2.   102.
30    4      0      0.    23.  1.   23.  2.   23.
30    5      0      0.    4.5  1.   4.5  2.   4.5
30    6                   18.  18.  18.
30    7      0      0.    390. 1.   390. 2.   390.
30    8                   114. 18.  114.
30    9      0      0.    1.02 1.   1.02 2.   1.02
30   10      0      0.    .04  1.   .04  2.   .04
30    1                   570. 18.  570.
31    2                   18.  18.  18.
31    3                   88.  6.   68.
31   40      0      0.    21.  6.5  21.
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31    6                   18.  18.  18.
31    7      0      0.    330. 6.5  330.
31    8                   57.  18.  57.
31    9      0      0.    .2   6.5  .2
31   10      0      0.    .08  6.5  .08
31    1                   510. 18.  510.
32    2                   26.  18.  26.  2.   26.
32    3      0      0.    102. 1.   102. 10.  102.
32    4      0      0.    23.  1.   23.  10.  23.
32    5      0      0.    4.5  1.   4.5  10.  4.5
32    6                   16.  18.  18.
32    7      0      0.    390. 1.   390. 10.  390.
32    8                   114. 18.  114.
32    9      0      0.    1.02 1.   1.02 10.  1.02
32   10      0      0.    .04  1.   .04  10.  .04
32    1                   570. 18.  570.
33    2                   30.  18.  32.
33    3      0      0.    58.  1.   58.  10.  58.
33    4      0      0.    21.  1.   21.  10.  21.
33    5      0      0.    4.2  1.   4.2  10.  4.2
33    6                   24.  18.  24.
33    7      0      0.    262.51.   262.510.  262.5
33    8                   18.  18.  18.
33    9      0      0.    .12  1.   .12  10.  .12
33   10      0      0.    .12  1.   .12  10.  .12
33    1                   420. 18.  420.
34    2                   18.  18.  16.  30.  18.
34    3      0      0.    86.  15.  66.  30.  86.
34    4      0      0.    21.  15.  21.  30.  21.
34    5      0      0.    4.8  6.1  4.8  10.5 6.   30.  6.
34    6             0.    24.  30.  24.
34    7      0      0.    315. 6.   315. 12.  255. 70.  255.
34    8                   54.  18.  54.  30.  54.
34    9             0.    1.28 30.  1.28
34   10      0      0.    .08  6.   .08  12.  .24  30.  .24
34    1                   420. 18.  420. 30.  420.
35    2                   14.  18.  14.
35    3      0      0.    58.  3.5  58.  10.  58.
35    4      0      0.    16.5 3.5  16.5 10.  16.5
35    5      0      0.    3.   3.5  3.   10.  3.
35    6                   12.  18.  12.
35    7      0      0.    285. 3.5  285. 10.  285.
35    8                   48.  18.  48.
35    9      0      0.    .72  3.5  .72  10.  .72
35   10      0      0.    .08  3.5  .08  10.  .08
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35   1             330.  10.  330.
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36   4    0   0.   27.   2.5  27.   10.  27.
36   5    0   0.   3.6   2.5  3.6   10.  3.6
36   6             12.   10.  12.
36   7    0   0.   225.  2.5  225.  10.  225.
36   8             30.   10.  30.
36   9    0   0.   .32   2.5  .32   10.  .32
36  10    0   0.   .08   2.5  .08   10.  .08
36   1             360.  10.  360.
37   2             20.   10.  20.
37   3    0   0.   100.  1.5  100.  10.  100.
37   4    0   0.   26.   1.5  26.   10.  26.
37   5    0   0.   5.2   1.5  5.2   10.  5.2
37   6             10.   10.  10.
37   7    0   0.   400.  1.5  400.  10.  400.
37   8             57.   10.  57.
37   9    0   0.   1.36  1.5  1.36  10.  1.36
37  10    0   0.   .08   1.5  .08   10.  .08
37   1             600.  10.  600.
38   2             16.   40.  16.
38   3    0   0.   68.   20.  68.   40.  68.
38   4    0   0.   17.   20.  17.   40.  17.
38   5    0   0.   3.    20.  3.    40.  3.
38   6             16.   40.  16.
38   7    0   0.   255.  20.  255.  40.  255.
38   8             42.   40.  42.
38   9    0   0.   .8    20.  .8    40.  .8
38  10    0   0.   .1    20.  .1    40.  .1
38   1             390.  40.  390.
39   2        0.   46.   50.  46.
39   3        0.   69.   50.  69.
39   4        0.   20.   50.  20.
39   5        0.   7.    50.  7.
39   6        0.   79.   50.  78.
39   7        0.   295.  50.  295.
39   8        0.   38.   50.  38.
39   9        0.   6.2   50.  6.2
39  10        0.   8.3   50.  8.3
39   1        0.   437.  50.  437.
40   2             28.   10.  28.
40   3    0   0.   68.   6.5  68.   13.  68.
40   4    0   0.   30.   6.5  32.   13.  30.
40   5    0   0.   38.   6.5  38.   13.  38.
40   6             10.   10.  10.
40   7    0   0.   270.  6.5  270.  13.  270.
40   8             42.   10.  42.
40   9    0   0.   .8    6.5  .8    13.  .8
40  10    0   0.   .06   6.5  .06   13.  .06
40   1             450.  10.  450.
41   2             28.   10.  28.
41   3    0   0.   68.   6.5  68.   13.  68.
41   4    0   0.   30.   6.5  30.   13.  30.
41   5    0   0.   38.   6.5  38.   13.  38.
41   6             10.   10.  10.
41   7    0   0.   270.  6.5  270.  13.  270.
41   8             42.   10.  42.
41   9    0   0.   .8    6.5  .8    13.  .8
41  10    0   0.   .06   6.5  .06   13.  .06
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42    4      0     0.    44.   21.   39.   31.5 36.   70.   36.
42    5      0     0.    6.    35.   6.    120.  6.
42    6                  36.   100.  36.
42    7      0     0.    300.  35.   300.  120.  300.
42    8                  259.  100.  259.
42    9      0     0.    .56   35.   .56   100.  .56
42    10     0     0.    .765  35.   .765  100.  .765
42    1                  780.  100.  780.
43    2                  32.   40.   32.   170.  32.
43    3      0     0.    105.  65.   105.  170.  105.
43    4      0     0.    32.   65.   32.   170.  32.
43    5      0     0.    6.    65.   65.   170.  65.
43    6                  60.   40.   60.   170.  60.
43    7      0     0.    270.  65.   270.  170.  270.
43    8                  126.  40.   126.  170.  126.
43    9      0     0.    1.4   65.   1.4   170.  1.4
43    10     0     0.    2.15  65.   2.15  170.  2.15
43    1                  600.  42.   600.  170.  600.
44    2                  10.   100.  12.
44    3      0     0.    64.   50.   64.   100.  64.
44    4      0     0.    16.   50.   16.   100.  16.
44    5      0     0.    1.8   50.   1.8   100.  1.8
44    6                  18.   100.  18.
44    7      0     0.    210.  50.   210.  120.  210.
44    8                  100.  40.   30.   120.  30.
44    9      0     0.    .72   50.   .72   100.  .72
44    10     0     0.    .1    50.   .1    100.  .1
44    1                  540.  45.   210.  100.  210.
45    2            0.    120.  3.    120.  9.    60.   30.   60.
45    3      0     0.    84.   15.   84.   30.   84.
45    4      0     0.    42.   3.    60.   6.    40.   30.   40.
45    5      0     0.    22.4  6.    5.6   15.   5.6   30.   5.6
45    6                  120.  10.5  36.   15.   36.   30.   36.
45    7      0     0.    430.  3.    525.  9.    345.  30.   345.
45    8            0.    242.  9.    110.  32.   110.
45    9      0     0.    1.52  15.   1.52  32.   1.52
45    10     0     0.    .32   15.   .32   30.   .32
45    1                  1020.9.     660.  11.   660.  30.   660.
46    2                  56.   20.   56.
46    3      0     0.    60.   4.    60.   10.   60.
46    4      0     0.    42.   4.    42.   10.   42.
46    5      0     0.    3.6   4.    3.6   10.   3.6
46    6                  32.   20.   32.
46    7      0     0.    405.  4.    405.  10.   405.
46    8                  120.  20.   120.
46    9      0     0.    1.44  4.    1.44  10.   1.44
46    10     0     0.    .08   4.    .08   10.   .08
46    1                  720.  20.   720.
47    2                  117.  40.   117.  80.   117.
47    3      0     0.    52.   40.   52.   80.   52.
47    4      0     0.    36.   40.   36.   80.   36.
47    5      0     0.    10.2  40.   10.2  82.   10.2
47    6                  102.  40.   102.  82.   102.
47    7      0     0.    495.  40.   495.  80.   495.
47    8                  180.  40.   180.  82.   180.
47    9      0     0.    2.32  40.   2.32  80.   2.32
47    10     0     0.    2.25  40.   2.25  82.   2.25
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48    7           0,   300, 620, 300,
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50    8                780, 9,   780, 12,  780,
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50    10     0    0,   .12  6,   .12  12,  .12
50    1                3040,9,   3040,12,  3040,
51    2                193, 16,  193, 72,  150, 160, 150,
51    3      0    0,   84,  80,  84,  160, 84,
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51    7      0    0,   500, 72,  460, 80,  460, 160, 460,
51    8                330, 56,  161, 100, 161, 160, 160,
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52    8           0,   780, 80,  780,
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53    6                240, 570, 169, 950, 221, 1500,221,
53    1                1200, 360,1100, 570, 860,1220, 860,
53    7                210, 420, 285, 870, 210, 1500, 210,
53    8                250, 475, 216, 950, 240, 1500,240,
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54    3           0.    93.  10.  93.
54    4           0.    10.  10.  10.
54    5           0.    31.  10.  31.
54    6                 330. 10.  330.
54    7                 231. 10.  231.
54    8                 410. 10.  410.
55    1           0.    4800.100. 4800.
55    2           0.    705. 100. 705.
55    3           0.    247. 100. 247.
55    4           0.    157. 100. 157.
55    5           0.    138. 100. 138.
55    6           0.    1820.100. 1820.
55    7           0.    147. 100. 147.
55    8           0.    660. 100. 660.
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56    2           0.    1840. 100.1840.
56    3           0.    140.  100.140.
56    4           0.    114.  100.114.
56    5           0.    160.  100.160.
56    6           0.    2950. 100.2950.
56    7           0.    744.  100.744.
56    8           0.    720.  100.720.
57    1           0.    1440. 10. 1440.
57    2           0.    360.  10. 360.
57    3           0.    37.   10. 37.
57    4           0.    37.   10. 37.
57    5           0.    24.   10. 24.
57    6           0.    540.  10. 540.
57    7           0.    244.  10. 244.
57    8           0.    92.   10. 92.
58    1           0.    1370. 10. 1370.
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58    3           0.    29.   10. 29.
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58    7           0.    244.  10. 244.
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59    3     0     0.     60. 1000. 60. 5000. 60.
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59    7     0     0.    180. 1000.180. 5000.180.
59    8     0     0.     51. 1000. 51. 5000. 51.
59    9     0     0.     32. 1000. 32. 5000. 32.
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 ,35  ,62 1,16 1,89 1,65 2,37  ,08  ,06  ,00 1,46  ,09  ,67  ,22  ,76  ,73 3,84
1,25  ,80  ,93  ,72 1,10  ,78 1,25  ,46 -,1
    3                   1 1,33  ,75 1,86 1,61 3,09 2,28  ,91 1,67  ,53 2,57  ,67  ,27
 ,22  ,76  ,96 1,87  ,40  ,55  ,04  ,00  ,05 1,13  ,01  ,77  ,20 1,18  ,83 2,56
1,14  ,73 1,10  ,53 1,38 2,10 1,60 1,20 -,1
88888
66666
    1              17,05 7,64 5,52 3,29  ,84  ,84  ,83  ,83  ,84 2,99 5,08 7,17
8,17 7,20 4,07 1,52  ,82  ,82  ,82  ,80  ,82 4,25 6,32 6,44 8,63 7,09 5,81 2,61
 ,29  ,29  ,29  ,29  ,38 3,02 6,09 6,73 -,1
    2              17,05 7,64 5,52 3,29  ,84  ,84  ,83  ,83  ,84 2,99 5,08 7,17
8,17 7,20 4,07 1,52  ,82  ,82  ,82  ,80  ,82 4,25 6,30 6,44 8,63 7,09 5,81 2,61
 ,29  ,29  ,29  ,29  ,30 3,02 6,09 6,73 -,1
    3              17,05 7,64 5,52 3,29  ,84  ,84  ,83  ,83  ,84 2,99 5,08 7,17
8,17 7,20 4,07 1,52  ,82  ,82  ,82  ,80  ,82 4,25 6,30 6,44 8,63 7,09 5,81 2,61
 ,29  ,29  ,29  ,29  ,30 3,02 6,09 6,73 -,1
88888
77777
1 11     0      4476  4476,5        4477      4478      4480      4482      4484
      4486      4488      4490      4492      4494
3 11     0                 780      6816     34024    138240    275614    428855
    595341    772028    961447   1160460   1369894
3  1     0                 766      6395     28897    112107    216216    326954
    442030    560365    682513    808963    940076
3  2     0                                                   2        31      1567
      7419     17870     31323     47292     65631
3  3     0                  14       421      5127     26131     59367    100334
    145684    193793    247611    304205     64 87
2 11     0        15      5599     17894     35525     63005     73116     80020
     86390     91413     97117    102004    107538
2  1     0        15      5461     15829     28555     49076     54101     56568
     58374     60048     62149     64349     66800
2  2     0                                                   6        23      1670
      4346      6033      7375      8585      9747
2  3     0                 138      2065      6970     13923     18992     21774
     23670     25332     27593     29070     30991
88888
99999
12345
```

```
   TITLE=UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

THE NUMBER OF TIME INCREMENTS IN THIS SIMULATION= 36

THE TIME PERIOD KEY IS = 0

THE BEGINNING STAGES IN THE LAKE SYSTEM ARE
BAY   STAGE
 1   4489.58
 2   4488.58
 3   4488.58
 4   4488.58
 5   4488.58
 6   4488.58
 7   4488.58
 8   4488.58
 9   4488.58
10   4488.58


********************************************************************************

********************************************************************************

*** SIMULATION SETUP AND INITIALIZATION DATA

********************************************************************************

IONS TO BE CARRIED IN THE SIMULATION=    1    2    3    4    5    6    7    8    9   10

********************************************************************************

***QUALITY OUTFLOW FACTOR =    1.
    0. MEANS THAT QUALITY READ IN FOR THE TRIB (OUTFLOW) WILL BE USED FOR THE OUTFLOW
    1. MEANS THAT THE LAKE QUALITY WILL BE USED FOR  THE OUTFLOW

********************************************************************************

INITIAL WATER QUALITY IN THE LAKE AND BAYS

BAY  QUALITY  QUAL UNIT
NO.    F.C.       KEY    CONCENTRATION
 1       1         0        940.000
 1       2         0        140.000
 1       3         0         50.000
 1       4         0         55.000
 1       5         0         20.000
 1       6         0        180.000
 1       7         0        230.000
 1       8         0        190.000
 1       9         0          0.230
 1      10         0          1.900
 1      11         0          0.000
 1      12         0          0.003
 2       1         0        590.000
 2       2         0         72.000
 2       3         0         62.000
 2       4         0         45.000
```

```
2     5        0      10,000
2     6        0      60,000
2     7        0     100,000
2     8        0     150,000
2     9        0       0,150
2    10        0       1,000
2    11        0       0,000
2    12        0       0,000
3     1        0    1050,000
3     2        0     100,000
3     3        0      55,000
3     4        0      55,000
3     5        0      24,000
3     6        0     300,000
3     7        0     190,000
3     8        0     265,000
3     9        0       0,200
3    10        0       0,230
3    11        0       0,000
3    12        0       0,020

********************************************************************************

NO, OF SUBAREAS IN THE LAKE SYSTEM =  3     THEIR CODE NOS, AND NAMES ARE=
 1  MAIN LK
 2  PROVO B
 3  GOSHEN B

********************************************************************************

INTERMIXING FRACTIONS FOR BAY  2 ARE   0,005 0,005 0,005 0,005 0,002 0,002 0,002 0,002 0,002 0,005 0,005 0,005
                                       0,005 0,005 0,005 0,005 0,002 0,002 0,002 0,002 0,002 0,005 0,005 0,005
                                       0,005 0,005 0,005 0,005 0,002 0,002 0,002 0,002 0,002 0,005 0,005 0,005

INTERMIXING FRACTIONS FOR BAY  3 ARE   0,150 0,150 0,150 0,150 0,100 0,100 0,100 0,100 0,100 0,150 0,150 0,150
                                       0,150 0,150 0,150 0,150 0,100 0,100 0,100 0,100 0,100 0,150 0,150 0,150
                                       0,150 0,150 0,150 0,150 0,100 0,100 0,100 0,100 0,100 0,150 0,150 0,150

********************************************************************************

***THE MULTIPLIERS TO BE APPLIED TO THE INPUT DATA ARE
    FLOWS, . . 1,000
    PRECIP . . 1,000
    EVAP . . . 1,000
```

```
  TITLE=UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

********************************************************************************

     BAY - TRIBUTARY ASSIGNMENT DATA

BAY   NO. OF    TRIBUTARY CODE NUMBERS
      TRIBS

 1     39         1    2    3    4    5    6    7    8    9   10
                 11   12   13   14   15   16   17   18   19   20
                 21   22   23   24   25   26   27   28   29   48
                 49   50   51   53   54   55   56   59   60

 2     17        31   32   33   34   35   36   37   38   39   40
                 41   42   43   44   45   46   47

 3      3        52   57   58
```

```
   TITLE=UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED
***THE TRIBS FLOWING OUT OF THE  SYSTEM ARE  53
```

```
TITLE=UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

        PRECIPITATION DATA

DAY  PRECIP UNIT  TIME BASE  REPEAT
NO.      KEY          KEY       KEY   PERIOD  PRECIP
 1        0            0         1       1    0,790
                                         2    0,780
                                         3    2,210
                                         4    1,180
                                         5    2,390
                                         6    1,400
                                         7    0,770
                                         8    1,420
                                         9    0,300
                                        10    1,900
                                        11    0,350
                                        12    0,320
                                        13    0,030
                                        14    0,670
                                        15    0,690
                                        16    1,180
                                        17    1,260
                                        18    1,640
                                        19    0,030
                                        20    0,020
                                        21    2,020
                                        22    1,160
                                        23    0,050
                                        24    0,650
                                        25    0,090
                                        26    0,400
                                        27    0,720
                                        28    2,870
                                        29    0,760
                                        30    0,610
                                        31    0,940
                                        32    1,140
                                        33    1,180
                                        34    1,130
                                        35    0,910
                                        36    0,610

 2        0            0         1       1    0,860
                                         2    1,240
                                         3    2,530
                                         4    1,490
                                         5    3,370
                                         6    1,660
                                         7    0,640
                                         8    2,150
                                         9    0,560
                                        10    2,160
                                        11    0,910
                                        12    0,520
                                        13    0,350
                                        14    0,620
                                        15    1,160
                                        16    1,890
                                        17    1,650
                                        18    2,370
                                        19    0,080
                                        20    0,060
                                        21    0,000
                                        22    1,460
                                        23    0,090
                                        24    0,670
                                        25    0,220
                                        26    0,760
                                        27    0,730
                                        28    3,840
                                        29    1,250
                                        30    0,820
                                        31    0,930
                                        32    0,720
                                        33    1,180
                                        34    0,780
                                        35    1,250
                                        36    0,460

 3        0          0          1        1    1,330
                                         2    0,750
                                         3    1,860
                                         4    1,610
                                         5    3,090
                                         6    2,230
                                         7    0,910
                                         8    1,670
                                         9    0,530
                                        10    2,570
                                        11    0,670
                                        12    0,270
                                        13    0,220
                                        14    0,760
                                        15    0,960
                                        16    1,870
                                        17    0,400
                                        18    0,550
                                        19    0,040
                                        20    0,000
                                        21    0,050
                                        22    1,130
                                        23    0,010
                                        24    0,770
                                        25    0,200
                                        26    1,180
                                        27    0,830
                                        28    2,560
                                        29    1,140
                                        30    0,730
                                        31    1,100
                                        32    0,530
                                        33    1,380
                                        34    2,100
                                        35    1,600
                                        36    1,200
```

```
KEY CODE-
    PRECIP UNIT KEY
            0 = IN.
            1 = FT.

    TIME UNIT KEY
            0 = MONTH
            1 = DAY
            2 = WEEK
            3 = MONTH
            4 = YEAR
```

```
TITLE=UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

        EVAPORATION DATA

BAY   EVAP UNIT    TIME BASE   REPEAT
NO       KEY          KEY       KEY    PERIOD  EVAPORATION
 1        0            0         1        1     7.050
                                          2     7.640
                                          3     5.520
                                          4     3.290
                                          5     0.840
                                          6     0.840
                                          7     0.830
                                          8     0.830
                                          9     0.840
                                         10     2.990
                                         11     5.080
                                         12     7.170
                                         13     8.170
                                         14     7.200
                                         15     4.070
                                         16     1.520
                                         17     0.820
                                         18     0.820
                                         19     0.820
                                         20     0.820
                                         21     0.820
                                         22     4.250
                                         23     6.300
                                         24     6.440
                                         25     8.630
                                         26     7.090
                                         27     5.810
                                         28     2.610
                                         29     0.290
                                         30     0.290
                                         31     0.290
                                         32     0.290
                                         33     0.300
                                         34     3.020
                                         35     6.090
                                         36     6.730

 2        0            9         1        1     7.050
                                          2     7.640
                                          3     5.520
                                          4     3.290
                                          5     0.840
                                          6     0.840
                                          7     0.830
                                          8     0.830
                                          9     0.840
                                         10     2.990
                                         11     5.060
                                         12     7.170
                                         13     8.170
                                         14     7.200
                                         15     4.070
```

```
                                  16      1,520
                                  17      0,020
                                  18      0,020
                                  19      0,020
                                  20      0,000
                                  21      0,020
                                  22      4,250
                                  23      6,300
                                  24      6,440
                                  25      8,630
                                  26      7,090
                                  27      5,010
                                  28      2,610
                                  29      0,290
                                  30      0,290
                                  31      0,290
                                  32      0,290
                                  33      0,300
                                  34      3,020
                                  35      6,090
                                  36      6,730

3     0          0     1           1      7,050
                                   2      7,640
                                   3      5,520
                                   4      3,290
                                   5      0,040
                                   6      0,040
                                   7      0,030
                                   8      0,030
                                   9      0,040
                                  10      2,990
                                  11      5,080
                                  12      7,170
                                  13      8,170
                                  14      7,260
                                  15      4,070
                                  16      1,520
                                  17      0,020
                                  18      0,020
                                  19      0,020
                                  20      0,000
                                  21      0,020
                                  22      4,250
                                  23      6,300
                                  24      6,440
                                  25      8,630
                                  26      7,090
                                  27      5,010
                                  28      2,610
                                  29      0,290
                                  30      0,290
                                  31      0,290
                                  32      0,290
                                  33      0,300
                                  34      3,020
                                  35      6,090
                                  36      6,730
```

```
KEY CODE=
    EVAPORATION UNIT KEY
            0 = IN,
            1 = FT,

    TIME UNIT KEY
            0 = MONTH
            1 = DAY
            2 = WEEK
            3 = MONTH
            4 = YEAR
```

```
  TITLE=UTAH LAKE --JULY 1970-JULY 1973--MIN SPRJ ADDED

       STAGE - AREA - VOLUME

BAY   STAGE       AREA       VOLUME
NO     FT         ACRES      AC.FT.


1    4476.00      15.00        0.00
1    4476.50    5461.00      766.00
1    4477.00   15829.00     6395.00
1    4478.00   28555.00    28897.00
1    4480.00   49076.00   112187.00
1    4482.00   54101.00   216216.00
1    4484.00   56568.00   326954.00
1    4486.00   58374.00   442038.00
1    4488.00   60848.00   560365.00
1    4490.00   62149.00   682513.00
1    4492.00   64349.00   808963.00
1    4494.00   66820.00   940876.00
1       0.00       0.10        0.00
1       0.00       0.10        0.00
1       0.00       0.10        0.00


2    4476.00       0.10        0.00
2    4476.50       0.10        0.00
2    4477.00       0.10        0.00
2    4478.00       0.10        0.00
2    4480.00       6.00        2.00
2    4482.00      23.00       31.00
2    4484.00    1678.00     1567.00
2    4486.00    4346.00     7419.00
2    4488.00    6033.00    17870.00
2    4490.00    7375.00    31323.00
2    4492.00    8585.00    47292.00
2    4494.00    9747.00    65631.00
2       0.00       0.10        0.00
2       0.00       0.10        0.00
2       0.00       0.10        0.00


3    4476.00       0.10        0.00
3    4476.50     138.00       14.00
3    4477.00    2065.00      421.00
3    4478.00    6970.00     5127.00
3    4480.00   13923.00    26131.00
3    4482.00   18992.00    59367.00
3    4484.00   21774.00   100334.00
3    4486.00   23672.00   145884.00
3    4488.00   25332.00   193793.00
3    4490.00   27593.00   247611.00
3    4492.00   29870.00   304265.00
3    4494.00   30991.00    64087.00
3       0.00       0.10        0.00
3       0.00       0.10        0.00
3       0.00       0.10        0.00
```

```
  11    4476.00       15.00        0.00
  11    4476.50     5599.00      790.00
  11    4477.00    17894.00     6816.00
  11    4478.00    35525.00    34024.00
  11    4480.00    63075.00   138240.00
  11    4482.00    73116.00   275614.00
  11    4484.00    80022.00   428855.00
  11    4486.00    86390.00   595341.00
  11    4488.00    91413.00   777228.00
  11    4490.00    97117.00   961447.00
  11    4492.00   102004.00  1160460.00
  11    4494.00   107538.00  1369894.00
  11       0.00        0.10        0.00
  11       0.00        0.10        0.00
  11       0.00        0.10        0.00

***ALL DATA HAS BEEN READ IN
```

```
        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

---BEGIN THE SIMULATION---

        ***INITIAL CONCENTRATIONS

           BAY     TDS        NA        CA        MG         K        CL      HCO3       SO4        NO3       PO4
MAIN LK     1     930.00    160.00     50.00     55.20     28.00    180.00    230.00    190.00      0.23      1.90      0.00      0.00
PROVO B     2     590.00     70.00     60.00     45.00     10.00     80.00    180.00    150.00      0.15      1.00      0.00      0.00
GOSHEN B    3    1050.00    180.00     55.00     55.00     24.00    300.00    190.00    265.00      0.20      0.23      0.00      0.00


    BAY     NO.  STAGE      AREA     VOLUME
  MAIN LK    1  4488.58   60857.3  595789.0
  PROVO B    2  4488.58    6422.2   21771.5
  GOSHEN B   3  4488.58   25987.7  209400.7

  TOTAL LAKE    4488.58   93267.2  826961.1
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 54   Q.F.=  9  FLOW=     8.13
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 54   Q.F.= 10  FLOW=     8.13
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 55   Q.F.=  9  FLOW=    11.26
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 55   Q.F.= 10  FLOW=    11.26
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 56   Q.F.=  9  FLOW=    11.26
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 56   Q.F.= 10  FLOW=    11.26
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 57   Q.F.=  9  FLOW=     4.20
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 57   Q.F.= 10  FLOW=     4.20
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 58   Q.F.=  9  FLOW=     4.20
***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 58   Q.F.= 10  FLOW=     4.20

     *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD  1

     *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD  1
```

```
      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD  1     --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

           BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
      NAME  NO.     AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
    MAIN LK   1     3992.    35622.   -27404.     536755.     -15694.  4487.87    59936.   552448.
    PROVO B   2      460.     3772.     7470.      25934.       8763.  4487.87     5920.    17171.
    GOSHEN B  3     2879.    15262.      500.     197518.       6930.  4487.87    25221.   190588.

  TOTAL SYSTEM       7331.   54655.   -19430.                   LAKE    4487.87    91877.   760287.


     *** WATER QUALITY AT THE END OF THE PERIOD

            BAY     TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
  MAIN LK    1    962.10   150.39    54.64    57.71    21.34   199.20   243.59   205.17     0.39     1.86
  PROVO B    2    661.02    70.92    72.74    46.02    11.26    80.61   230.76   150.03     0.72     1.48
  GOSHEN B   3   1092.27   185.22    57.80    56.20    24.65   300.37   208.62   269.15     0.24     0.50



     ***TIME PERIOD  2 HAS BEGUN
  ***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 54   Q.F.=  9  FLOW=    8.13
  ***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 54   Q.F.= 10  FLOW=    8.13
  ***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 55   Q.F.=  9  FLOW=   11.26
  ***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 55   Q.F.= 10  FLOW=   11.26
  ***TROUBLE--FLOWRATE NOT FOUND IN FLOW-QUALITY TABLE--TRIB= 56   Q.F.=  9  FLOW=   11.26

     *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD  2

     *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD  2
```

```
      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD  2     --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

          BAY       PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
      NAME  NO.     AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT   STAGE        AREA      VOLUME
    MAIN LK   1     3894.    38144.   -33520.     484679.     -16155.   4486.99      59206.    500833.
    PROVO B   2      612.     3760.     7829.      21844.       9232.   4486.99       5184.     12612.
    GOSHEN B  3     1576.    16851.      500.     176613.       6923.   4486.99      24496.    169689.

  TOTAL SYSTEM        6081.    57962.   -25191.                    LAKE     4486.99      88886.    683135.


      *** WATER QUALITY AT THE END OF THE PERIOD

            BAY     TDS        NA        CA        MG        K        CL       HCO3      SO4       NO3       PO4
   MAIN LK   1    1037.33    142.63     60.16     61.19     22.95    220.17    262.02    222.61     0.58      1.86
   PROVO B   2     734.11     73.10     83.09     46.63     12.17     81.36    302.89    164.95     1.33      1.96
   GOSHEN B  3    1159.72    194.88     62.10     62.71     26.26    308.96    231.54    279.94     0.31      0.75


      ***TIME PERIOD  3 HAS BEGUN

      *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD  3

      *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD  3
```

```
UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD  3     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

       BAY      PRECIP    EVAP    SUM TRIB    VOL BEFORE   INTERFLOW      F I N A L
   NAME  NO.    AC-FT    AC-FT  INFLOW AC-FT   INTERFLOW   VOL AC-FT   STAGE     AREA      VOLUME
 MAIN LK   1   10899.   27224.    -10430.      474071.       920.   4486.69    58953.    482991.
 PROVO B   2    1093.    2384.      8360.       19701.       665.   4486.69     4930.     11036.
 GOSHEN B  3    3795.   11264.       500.      162721.       256.   4486.69    24245.    162465.

TOTAL SYSTEM      15787.   40871.    -1558.                     LAKE    4486.69    88128.   6[illegible]49[illegible].


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS        NA        CA        MG        K        CL       HCO3      SO4        NO3       PO4
MAIN LK    1   1069.11    167.31     63.77     62.20    23.52    229.27    273.68    229.14      0.75      1.82
PROVO B    2    721.61     65.67     83.12     41.86    11.45     72.61    320.40    153.60      1.67      2.07
GOSHEN B   3   1190.86    190.51     64.69     64.97    26.84    300.87    247.17    202.24      0.39      0.94



 ***TIME PERIOD  4 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD  4

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD  4
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     UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

      ***SUMMARY INFORMATION FOR TIME PERIOD  4     --  MONTHS

      *** PERIOD FLOWS AND INTERFLOWS

        BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
     NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
   MAIN LK   1   5795.   16157.    19322.      491952.       -484.  4486.85    59087.   492436.
   PROVO B   2    612.    1351.     8774.       19071.       7201.  4486.85     5845.    11870.
   GOSHEN B  3   3252.    6645.      500.      159573.      -6717.  4486.85    24378.   166289.

 TOTAL SYSTEM      9658.   24152.    28596.                    LAKE    4486.85    88529.   678595.


    *** WATER QUALITY AT THE END OF THE PERIOD

           BAY    TDS       NA        CA        MG        K        CL      HCO3     SO4        NO3       PO4
 MAIN LK    1   1071.04   166.59    66.24     61.51     23.36    230.33   280.06   228.58     0.90      1.72
 PROVO B    2    691.23    59.82    83.82     37.02     10.35     62.99   334.41   144.84     1.68      1.84
 GOSHEN B   3   1188.80   196.22    66.01     65.35     26.62    299.58   257.75   276.24     0.49      1.11




    ***TIME PERIOD  5 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD  5

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD  5
 UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

  ***SUMMARY INFORMATION FOR TIME PERIOD  5     --  MONTHS

  *** PERIOD FLOWS AND INTERFLOWS

      BAY       PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
   NAME  NO.    AC-FT   AC-FT  INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE       AREA     VOLUME
 MAIN LK   1   11763.    4134.    38658.     538723.       4918.  4487,55     59672.   533884.
 PROVO B   2    1422.     354.     9349.      22287.       6763.  4487,55      5654.    15524.
 GOSHEN B  3    6275.    1786.      588.     171358.     -11681.  4487,55     24959.   183039.

TOTAL SYSTEM      19460.    6195.   48507.                  LAKE    4487,55     90285.   732367.


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG        K       CL      HCO3     SO4       NO3      PO4
MAIN LK    1   1012,78   156,04   65,26    57,58    21,01   216,95   271,45   214,63     0,99     1,56
PROVO B    2    608,64    49,46   77,87    38,79     8,56    51,41   305,78   123,11     1,55     1,57
GOSHEN B   3   1134,46   185,08   64,32    62,55    25,25   280,13   254,16   259,66     0,56     1,15



 ***TIME PERIOD  6 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,002 FOR TIME PERIOD  6

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,100 FOR TIME PERIOD  6
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      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD  6      --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

          BAY      PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
      NAME  NO.    AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE       AREA      VOLUME
    MAIN LK   1    6959.    4175.    33589.     570177.        3603.  4488.10    60155.    566574.
    PROVO B   2     782.     396.     9036.      24946.        6392.  4488.10     6181.     18554.
    GOSHEN B  3    4740.    1746.      500.     186533.       -9996.  4488.10    25447.    196529.

  TOTAL SYSTEM      12481.    6317.    43125.                  LAKE    4488.10     91783.    781656.


     *** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS        NA        CA        MG        K        CL      HCO3      SO4        NO3       PO4
   MAIN LK   1   969.22    147.91     64.83     54.43     20.61    286.65   265.89    283.90      1.08      1.43
   PROVO B   2   575.18     46.43     75.22     28.85      0.00     47.98   301.72    116.36      1.54      1.51
   GOSHEN B  3  1894.91    178.03     63.45     60.42     24.21    265.87   252.42    247.37      0.63      1.18




    ***TIME PERIOD  7 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD  7

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD  7
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      UTAH LAKE --JULY 1970-JULY 1979--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD  7     --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

           BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
      NAME  NO.     AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
   MAIN LK   1      3850.    4159.    24817.     591890.       1576.  4480,48    60549.    589514.
   PROVO B   2       325.     422.     6947.      27484.       6324.  4480,48     6353.     21880.
   GOSHEN B  3      1929.    1759.     2838.     198736.      -7900.  4480,48    25872.    286636.

 TOTAL SYSTEM        6113.    6300.    35802.                      LAKE    4480,48    92774.   817230.


     *** WATER QUALITY AT THE END OF THE PERIOD

             BAY    TDS       NA        CA        MG        K        CL      HCO3      SO4        NO3       PO4
   MAIN LK    1    940,91   142,44    64,83     52,32     19,70   200.04   263,22   196,63      1,16      1,34
   PROVO B    2    572,40    45,45    75,64     20,36      0,01    47,13   303,96   115,43      1,56      1,52
   GOSHEN B   3   1080,79   174,08    63,40     59,50     23,59   264,69   255,19   243,37      0,70      1,19




     ***TIME PERIOD  8 HAS BEGUN

     *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,002 FOR TIME PERIOD  8

     *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,100 FOR TIME PERIOD  8
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD  8     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

       BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW         F I N A L
    NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
  MAIN LK   1   7162.    4186.    18351.     610841.       -504.  4488.83    60925.   611345.
  PROVO B   2   1138.     439.     8287.      30866.       6581.  4488.83     6593.    23485.
  GOSHEN B  3   3599.    1789.     1731.     210177.      -6077.  4488.83    26276.   216255.

TOTAL SYSTEM     11899.   6414.    20369.                   LAKE   4488.83    93794.   851084.


 *** WATER QUALITY AT THE END OF THE PERIOD

        BAY    TDS      NA       CA       MG       K       CL      HCO3     SO4      NO3     PO4
MAIN LK  1    914.87  137.71   64.46    30.40    19.02   194.36   259.91   190.04    1.20    1.26
PROVO B  2    556.60   43.79   72.56    27.40     7.02    45.45   297.39   111.73    1.53    1.47
GOSHEN B 3   1070.54  170.32   62.90    50.06    22.83   259.95   254.98   237.86    0.75    1.18



***TIME PERIOD  9 HAS BEGUN

*** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD  9

*** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD  9
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        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

         ***SUMMARY INFORMATION FOR TIME PERIOD  9     --  MONTHS

         *** PERIOD FLOWS AND INTERFLOWS

              BAY       PRECIP    EVAP   SUM TRIB   VOL BEFORE    INTERFLOW        F I N A L
         NAME  NO.      AC-FT    AC-FT INFLOW AC-FT  INTERFLOW    VOL AC-FT  STAGE        AREA       VOLUME
      MAIN LK   1       1523.     4263.     12544.     621148.       -2560.  4489.04      61138.     623709.
      PROVO B   2        308.      461.      8982.      32313.        7466.  4489.04       6729.      24846.
      GOSHEN B  3       1168.     1839.      1220.     216796.       -4986.  4489.04      26505.     221702.

    TOTAL SYSTEM          2998.     6563.     22746.                  LAKE    4489.04      94371.     870257.


       *** WATER QUALITY AT THE END OF THE PERIOD

                 BAY      TDS        NA         CA         MG          K         CL        HCO3       SO4         NO3        PO4
     MAIN LK      1     900.05    134.69     64.72      49.16      10.53     191.01     259.94     185.03       1.26       1.20
     PROVO B      2     554.22     43.31     72.33      27.30       0.00      45.30     299.95     109.70       1.54       1.47
     GOSHEN B     3    1059.80    167.46     63.19      57.20      22.37     255.99     256.90     232.64       0.02       1.10


       ***TIME PERIOD 10 HAS BEGUN

       *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 10

       *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 10
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   UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

    ***SUMMARY INFORMATION FOR TIME PERIOD 10     --  MONTHS

    *** PERIOD FLOWS AND INTERFLOWS

       BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
     NAME  NO,  AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
   MAIN LK   1   9676.  15227.    23869.     642827.         567.  4489,33   61443.    641459.
   PROVO B   2   1211.   1676.     9742.      34123.        7322.  4489,33    6924.     26801.
   GOSHEN B  3   5674.   6601.      859.     221634.       -7889.  4489,33   26833.    229523.

 TOTAL SYSTEM      16561.  23505.   34470.                    LAKE    4489,33   95200.   897784.


  *** WATER QUALITY AT THE END OF THE PERIOD

           BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
 MAIN LK    1   888,00   131,83   65,26    40,10   10,85   120,85   268,90   182,25    1,31     1,15
 PROVO B    2   948,54    42,91   72,77    27,32    8,22    45,67   302,41   187,64    1,57     1,50
 GOSHEN B   3  1034,74   162,00   63,71    55,70   21,64   246,86   258,79   224,39    0,91     1,10



  ***TIME PERIOD 11 HAS BEGUN

  *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,005 FOR TIME PERIOD 11

  *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,150 FOR TIME PERIOD 1.
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           UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

            ***SUMMARY INFORMATION FOR TIME PERIOD 11     --  MONTHS

            *** PERIOD FLOWS AND INTERFLOWS

         BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
     NAME  NO.    AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
   MAIN LK  1     1791.   26000.     3696.     620946.      -5749.  4489.89    61189.   626695.
   PROVO B  2      525.    2930.     9042.      33438.       8763.  4489.89     6762.    25175.
   GOSHEN B 3     1490.   11355.      838.     220504.      -2514.  4489.89    26560.   223018.

 TOTAL SYSTEM       3814.   40285.    13576.                  LAKE    4489.89    94510.   874888.


          *** WATER QUALITY AT THE END OF THE PERIOD

            BAY      TDS       NA       CA       MG        K       CL     HCO3     SO4       NO3       PO4
  MAIN LK    1     915.14   134.99    68.45    49.22    18.46   193.45   273.28  186.85     1.40      1.15
  PROVO B    2     583.61    44.34    81.28    29.07     9.03    47.93   319.55  115.44     1.69      1.63
  GOSHEN B   3    1056.81   164.18    66.79    56.70    21.92   240.36   271.08  226.07     1.02      1.21




          ***TIME PERIOD 12 HAS BEGUN

          *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.085 FOR TIME PERIOD 12

          *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 12
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 12     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

       BAY     PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
    NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
  MAIN LK   1   1631.   36546.       -67.     591713.     -5702.  4488.61    69685.   597415.
  PROVO B   2    293.    4039.      8018.      29448.      7497.  4488.61     6440.    21951.
  GOSHEN B  3    597.   15863.       570.     208322.     -1795.  4488.61    26018.   210117.

TOTAL SYSTEM       2521.   56447.     8521.                     LAKE    4488.61    93143.   829483.


  *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
MAIN LK    1    958.36   140.44    72.89    51.19    19.21   202.14   289.33   194.82    1.53     1.19
PROVO B    2    660.84    50.36    89.09    32.71    10.29    54.34   357.91   129.60    1.98     1.93
GOSHEN B   3   1106.45   170.76    71.81    59.22    22.82   256.77   290.67   235.38    1.17     1.28



  ***TIME PERIOD 13 HAS BEGUN

  *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 13

  *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 13
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     UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

      ***SUMMARY INFORMATION FOR TIME PERIOD 13     --  MONTHS

      *** PERIOD FLOWS AND INTERFLOWS

         BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
     NAME  NO.    AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
  MAIN LK   1      152.   41380.   -30603.     525664.     -15984.  4487.68    59783.    541647.
  PROVO B"  2      188.    4303.     7272.      25028.       8811.  4487.68     5766.     16217.
  GOSHEN B  3      477.   17707.      508.     193387.       7173.  4487.68    25069.    186215.

 TOTAL SYSTEM       816.   63390.   -22831.                 LAKE    4487.68    90618.    744079.


     *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4      NO3     PO4
 MAIN LK   1   1041.87   152.86    79.27    50.28   20.91   221.12   314.65   211.54    1.74    1.29
 PROVO B   2    749.59    57.28   100.67    37.04   11.81    61.67   404.00   147.00    2.33    2.31
 GOSHEN B  3   1179.88   181.10    78.29    62.98   24.23   270.97   316.16   240.88    1.34    1.37



     ***TIME PERIOD 14 HAS BEGUN

     *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 14

     *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 14
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      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD 14      --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

            BAY      PRECIP    EVAP    SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
       NAME  NO.     AC-FT    AC-FT INFLOW AC-FT  INTERFLOW    VOL AC-FT  STAGE       AREA       VOLUME
    MAIN LK   1      3337.    35854.   -34231.      474897.      -16606.  4486.84     59074.     491583.
    PROVO B   2       298.     3458.     7983.       21839.        9251.  4486.84      5051.      11788.
    GOSHEN B  3      1587.    15035.      500.      173266.        7354.  4486.84     24365.     165912.

  TOTAL SYSTEM         5221.   54349.   -25748.                  LAKE     4486.84     88490.     669283.


      *** WATER QUALITY AT THE END OF THE PERIOD

              BAY     TDS        NA        CA        MG        K        CL       HCO3      SO4        NO3       PO4
   MAIN LK     1    1117.32    163.90     85.31     58.89     22.43    238.01    338.38    226.58      1.96      1.39
   PROVO B     2     812.29     62.84    110.62     39.65     12.35     66.91    433.35    162.09      2.60      2.64
   GOSHEN B    3    1247.66    190.75     84.41     66.30     25.53    284.09    348.15    261.22      1.52      1.46



      ***TIME PERIOD 15 HAS BEGUN

      *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 15

      *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 15
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

***SUMMARY INFORMATION FOR TIME PERIOD 15     --  MONTHS

***.PERIOD FLOWS AND INTERFLOWS

           BAY     PRECIP    EVAP    SUM TRIB   VOL BEFORE   INTERFLOW         F I N A L
      NAME  NO.    AC-FT    AC-FT  INFLOW AC-FT  INTERFLOW   VOL AC-FT   STAGE      AREA      VOLUME
    MAIN LK   1    3395.    20828.    -14265.     460606.     -10766.   4486.50    50789.    471371.
    PROVO B   2     488.     1713.      7873.      18436.       8427.   4486.50     4764.     18010.
    GOSHEN B  3    1948.     8260.       500.     160100.       2339.   4486.50    24082.    157761.
  TOTAL SYSTEM     5832.    30881.     -5892.
                                                               LAKE     4486.50    87635.    639142.

  *** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3     PO4
MAIN LK    1    1150.10   168.35    88.62    60.31   23.86   244.77   351.20   232.46    2.15    1.43
PROVO B    2     785.70    61.04   108.26    37.77   11.54    64.25   413.56   168.22    2.49    2.58
GOSHEN B   3    1274.09   194.02    87.74    67.54   25.99   207.95   352.95   264.98    1.67    1.58


***TIME PERIOD 16 HAS BEGUN

*** THE INTERMIXING FRACTION FOR BAY  2 IS  0.085 FOR TIME PERIOD 16

*** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 16
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

***SUMMARY INFORMATION FOR TIME PERIOD 16     --  MONTHS

*** PERIOD FLOWS AND INTERFLOWS
                                                                      F I N A L
       BAY      PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW   STAGE      AREA      VOLUME
  NAME   NO.    AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT
MAIN LK   1     5779.    7444.     28806.     498512.       1168.   4486.93    59156.    497344.
PROVO B   2      750.     603.      9371.      19528.       7224.   4486.93     5135.     12304.
GOSHEN B  3     3751.    3049.      1422.     159885.      -8392.   4486.93    24447.    168277.

                                                             LAKE   4486.93    88738.    677925.
TOTAL SYSTEM    10280.   11096.     39599.


*** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS       NA       CA       MG       K       CL      HCO3     SO4      NO3     PO4
MAIN LK    1   1115.86   161.96    87.76    58.21   22.21   235.79   346.32   224.17    2.18    1.37
PROVO B    2    683.48    52.11    96.65    32.51    9.47    54.58   358.53   140.96    2.10    2.13
GOSHEN B   3   1247.98   188.31    87.10    65.52   25.13   282.22   350.65   257.72    1.76    1.46



***TIME PERIOD 17 HAS BEGUN

*** THE INTERMIXING FRACTION FOR BAY  2 IS  0.082 FOR TIME PERIOD 17

*** THE INTERMIXING FRACTION FOR BAY  3 IS  0.108 FOR TIME PERIOD 17
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 17     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

        BAY      PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
     NAME  NO.   AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
  MAIN LK   1    6209.    4041.    37622.     537135.       5668.  4487.51    59639.   531467.
  PROVO B   2     706.     351.     9080.      21739.       6421.  4487.51     5621.    15318.
  GOSHEN B  3     815.    1670.     2502.     170003.     -12089.  4487.51    24926.   182092.

TOTAL SYSTEM      7729.    6061.    49204.                   LAKE    4487.51    90186.   728877.


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA        CA        MG        K        CL       HCO3     SO4       NO3      PO4
MAIN LK    1   1065.72   153.49    85.40     55.27    21.01    223.94   335.16   212.01     2.16     1.28
PROVO B    2    628.30    47.60    89.65     29.85     8.35     49.00   330.62   129.31     1.09     1.00
GOSHEN B   3   1245.75   186.05    86.62     64.45    24.55    285.94   350.58   256.38     1.01     1.42



 ***TIME PERIOD 18 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 18

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 18
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    UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

     ***SUMMARY INFORMATION FOR TIME PERIOD 18     --  MONTHS

     *** PERIOD FLOWS AND INTERFLOWS

         BAY      PRECIP   EVAP    SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
     NAME   NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT   STAGE      AREA      VOLUME
   MAIN LK   1    8147.    4074.    33096.     569436.        5616.  4488.06    60107.   563021.
   PROVO B   2    1110.     304.     8892.      24135.        5885.  4488.06     6071.    10251.
   GOSHEN B  3    1142.    1703.     2283.     183815.      -11501.  4488.06    25396.   195316.

 TOTAL SYSTEM      10399.   6160.    44271.                       LAKE   4488.06    91574.   777307.


   *** WATER QUALITY AT THE END OF THE PERIOD

           BAY    TDS       NA        CA       MG        K        CL      HCO3     SO4       NO3      PO4
  MAIN LK   1   1020.11   145.91    83.01    52.61    19.92   213.54   324.49   202.55    2.15     1.21
  PROVO B   2    584.78    44.03    81.52    27.06     7.67    45.83   310.66   119.05    1.77     1.74
  GOSHEN B  3   1231.38   182.40    85.01    63.01    23.98   284.97   348.14   252.46    1.85     1.37



   ***TIME PERIOD 19 HAS BEGUN

   *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 19

   *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 19
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     UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

      ***SUMMARY INFORMATION FOR TIME PERIOD 19     --  MONTHS

      *** PERIOD FLOWS AND INTERFLOWS

          BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
       NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
    MAIN LK   1     150.    4106.    21925.     501790.        1448.  4488.33    60392.   580342.
    PROVO B   2      40.     415.     8161.      26037.        5967.  4488.33     6252.    20070.
    GOSHEN B  3      85.    1735.     1514.     195179.       -7415.  4488.33    25702.   282595.

  TOTAL SYSTEM         275.    6255.    31600.                      LAKE    4488.33    92346.   883007.


    *** WATER QUALITY AT THE END OF THE PERIOD

            BAY    TDS       NA        CA        MG        K        CL      HCO3     SO4       NO3       PO4
 MAIN LK     1    998.56   142.16    82.16     51.23    19.36   208.60   320.47   197.34     2.20      1.16
 PROVO B     2    580.32    43.75    79.10     27.76     7.56    45.85   312.16   116.56     1.75      1.71
 GOSHEN B    3   1218.53   179.62    85.63     61.98    23.46   282.13   347.21   248.75     1.90      1.35




    ***TIME PERIOD 20 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 20

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 20
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 18     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

      BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
   NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
 MAIN LK   1    8147.    4074.    33896.     569436.       5616.  4488.26    60107.   563821.
 PROVO B   2    1110.     384.     8092.      24135.       5905.  4488.26     6071.    18251.
 GOSHEN B  3    1142.    1703.     2283.     183815.     -11521.  4488.26    25396.   195316.

TOTAL SYSTEM     12399.   6160.    44271.                   LAKE     4488.26   91574.   777387.


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4      NO3      PO4
MAIN LK    1   1022.11   145.91   83.01    52.61    19.92   213.54   324.49   282.55    2.15     1.21
PROVO B    2    504.78    44.03   81.52    27.86     7.67    45.83   310.66   119.85    1.77     1.78
GOSHEN B   3   1231.35   182.40   85.81    63.01    23.90   284.97   348.14   252.46    1.85     1.37


 ***TIME PERIOD 19 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 19

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 19
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      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD 19     --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

            BAY       PRECIP    EVAP    SUM TRIB    VOL BEFORE    INTERFLOW       F I N A L
        NAME  NO.     AC-FT    AC-FT INFLOW AC-FT   INTERFLOW     VOL AC-FT   STAGE       AREA       VOLUME
     MAIN LK   1       150.     4106.     21925.      581790.         1448.  4488,33     60392.     580342.
     PROVO B   2        40.      415.      8161.       26037.         5967.  4488,33      6252.      20070.
     GOSHEN B  3        85.     1735.      1514.      195179.        -7415.  4488,33     25702.     202595.

   TOTAL SYSTEM         275.     6255.     31600.                     LAKE     4488,33     92346.     803007.


       *** WATER QUALITY AT THE END OF THE PERIOD

             BAY     TDS       NA        CA        MG        K        CL       HCO3      SO4        NO3       PO4
   MAIN LK    1     998,56   142,16    82,16     51,23     19,36   208,68    320,47    197,34      2,20      1,16
   PROVO B    2     580,32    43,75    79,10     27,76      7,56    45,85    312,16    116,56      1,75      1,71
   GOSHEN B   3    1210,53   179,62    85,63     61,98     23,46   282,13    347,21    240,75      1,90      1,35




       ***TIME PERIOD 20 HAS BEGUN

       *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,002 FOR TIME PERIOD 20

       *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,100 FOR TIME PERIOD 20
     UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

      ***SUMMARY INFORMATION FOR TIME PERIOD 20     --  MONTHS

      *** PERIOD FLOWS AND INTERFLOWS

          BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
     NAME  NO.     AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
  MAIN LK   1       101.    4024.    17928.     594346.       -189.  4488.56    60636.    594535.
  PROVO B   2        31.     417.     7591.      27276.       5642.  4488.56     4408.     21633.
  GOSHEN B  3         0.    1713.     2513.     203395.      -5453.  4488.56    25965.    208848.

TOTAL SYSTEM        132.    6154.    28032.                   LAKE    4488.56    93009.   825017.


    *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG        K       CL      HCO3     SO4       NO3      PO4
 MAIN LK   1    981.81   139.25    81.43    50.09    18.89   285.24   317.15   193.17     2.22     1.13
 PROVO B   2    583.78    44.36    77.60    27.90     7.48    46.67   314.86   116.97     1.77     1.72
 GOSHEN B  3   1216.44   178.11    85.26    61.23    23.07   284.58   346.82   247.73     1.94     1.31




    ***TIME PERIOD 21 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 21

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 21
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 21     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

      BAY       PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
    NAME  NO,    AC-FT    AC-FT INFLOW AC-FT INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
 MAIN LK   1      101,     4142,    22191,    612685,        810,  4488,84    60934,   611875,
 PROVO B   2        0,      438,     9663,     32859,       7315,  4488,84     6599,    23543,
 GOSHEN B  3      108,     1774,     1180,    200363,      -8125,  4488,84    26285,   216488,

TOTAL SYSTEM       209,     6353,    33034,                        LAKE    4488,84    93818,   851987,


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS      NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
MAIN LK    1    959,07   135,08   80,54    40,68   10,27   199,78   313,11   187,75     2,23     1,08
PROVO B    2    589,24    46,44   76,42    20,87    7,47    40,51   320,84   117,22     1,79     1,74
GOSHEN B   3   1195,82   174,43   84,98    59,99   22,50   270,49   344,66   242,33     1,98     1,20




 ***TIME PERIOD 22 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,095 FOR TIME PERIOD 22

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,150 FOR TIME PERIOD 22
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

***SUMMARY INFORMATION FOR TIME PERIOD 22     --  MONTHS

*** PERIOD FLOWS AND INTERFLOWS

          BAY     PRECIP    EVAP    SUM TRIB   VOL BEFORE   INTERFLOW          F I N A L
    NAME   NO.    AC-FT    AC-FT  INFLOW AC-FT  INTERFLOW   VOL AC-FT   STAGE      AREA      VOLUME
 MAIN LK    1     5808.    21572.     17837.      614028.       -324.   4488.08    60977.    614352.
 PROVO B    2      883.     2336.      8953.       30963.       7147.   4488.08     6626.     23816.
 GOSHEN B   3     2474.     9306.      1100.      210757.      -6823.   4488.08    26331.    217579.
TOTAL SYSTEM      9165.    33214.     27890.
                                                                LAKE   4488.08    93934.    855747.

*** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K        CL       HCO3     SO4       NO3      PO4
MAIN LK    1    969.01   136.04   81.67    48.93    18.32   202.40   317.22   189.25     2.30     1.00
PROVO B    2    609.40    47.99   80.97    29.13     7.75    50.45   331.02   121.02     1.06     1.00
GOSHEN B   3   1190.73   172.01   86.41    59.57    22.39   274.79   348.75   239.01     2.08     1.27


***TIME PERIOD 23 HAS BEGUN

*** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 23

*** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 23
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

***SUMMARY INFORMATION FOR TIME PERIOD 23     --  MONTHS

*** PERIOD FLOWS AND INTERFLOWS

          BAY     PRECIP    EVAP    SUM TRIB   VOL BEFORE   INTERFLOW          F I N A L
    NAME  NO.     AC-FT     AC-FT  INFLOW AC-FT INTERFLOW   VOL AC-FT   STAGE        AREA       VOLUME
 MAIN LK   1       254.     32008.     -9253.     573353.      -8302.  4488.35      60414.     581655.
 PROVO B   2        50.      3477.      6929.      27317.       7102.  4488.35       6267.      20215.
 GOSHEN B  3        22.     13810.       590.     204373.       1200.  4488.35      25726.     203173.

TOTAL SYSTEM        326.    49296.     -1734.
                                                              LAKE     4488.35      92407.     805043.

*** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS        NA        CA        MG        K        CL       HCO3      SO4       NO3      PO4
MAIN LK    1    1016.15    142.14    86.04     51.03     19.15    212.46    333.77    190.07     2.46     1.13
PROVO B    2     698.98     54.02    93.77     32.93      8.86     57.30    370.62    141.13     2.13     2.14
GOSHEN B   3    1232.02    178.27    91.13     61.56     23.16    281.47    366.02    246.72     2.26     1.32


***TIME PERIOD 24 HAS BEGUN

*** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 24

*** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 24
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     UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

      ***SUMMARY INFORMATION FOR TIME PERIOD 24     --  MONTHS

      *** PERIOD FLOWS AND INTERFLOWS

          BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
     NAME  NO.     AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
   MAIN LK   1     3271.   32409.     4275.     556792.      -4022.  4488.01    60056.   560814.
   PROVO B   2      350.    3362.     7207.      24410.       6490.  4488.01     6038.    17919.
   GOSHEN B  3     1650.   13801.      500.     191523.      -2468.  4488.01    25340.   193991.

 TOTAL SYSTEM        5271.   49572.    11982.                    LAKE     4488.01    91434.   772724.


    *** WATER QUALITY AT THE END OF THE PERIOD

          BAY     TDS        NA        CA        MG        K        CL       HCO3      SO4        NO3       PO4
  MAIN LK   1   1043.98    144.75     89.70     52.18     19.54    217.02   346.05   202.73      2.57      1.15
  PROVO B   2    753.19     58.20    105.78     35.95      9.81     61.98   397.81   157.47      2.36      2.44
  GOSHEN B  3   1265.48    182.41     95.56     63.16     23.77    285.93   381.65   251.92      2.42      1.36




    ***TIME PERIOD 25 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.085 FOR TIME PERIOD 25

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 25
   UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

    ***SUMMARY INFORMATION FOR TIME PERIOD 25     --  MONTHS

    *** PERIOD FLOWS AND INTERFLOWS

        BAY      PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
     NAME  NO.   AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE       AREA      VOLUME
  MAIN LK   1     450,    43173,   -32035,     486854,    -13791,  4486,98    59192,    499845,
  PROVO B   2     111,     4341,     5219,      10909,      6384,  4486,98     5170,     12525,
  GOSHEN B  3     422,    18217,      508,     176696,      7407,  4486,98    24482,    169289,

 TOTAL SYSTEM       983,   65730,   -26319,                 LAKE    4486,98    88844,   681658,


    *** WATER QUALITY AT THE END OF THE PERIOD

           BAY    TDS        NA        CA        MG        K        CL      HCO3      SO4        NO3       PO4
 MAIN LK    1   1144,16    158,61     97,96     56,78     21,44    239,21   377,54   221,51      3,86      1,36
 PROVO B    2    861,47     65,53    122,81     41,41     12,85     72,51   454,73   177,38      2,92      3,11
 GOSHEN B   3   1353,95    194,36    103,98     67,44     25,42    383,36   413,83   268,89      2,72      1,47



    ***TIME PERIOD 26 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,085 FOR TIME PERIOD 26

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,150 FOR TIME PERIOD 26
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 26     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

          BAY     PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
     NAME  NO.    AC-FT    AC-FT INFLOW AC-FT INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
   MAIN LK  1     1972.   34959.   -34137.     432721.     -16231.  4486.12    58472.    448952.
   PROVO B  2      327.    3053.     5409.      15207.       7178.  4486.12     4445.      8030.
   GOSHEN B 3     2406.   14459.      500.     157737.       9053.  4486.12    23767.    148684.
 TOTAL SYSTEM      4706.   52471.   -28228.                    LAKE   4486.12    86684.    605640.

 *** WATER QUALITY AT THE END OF THE PERIOD

           BAY     TDS       NA       CA       MG       K       CL      HCO3      SO4      NO3     PO4
 MAIN LK    1   1234.52   171.02   105.51    60.84   23.19   259.10   406.19   230.36    3.59    1.57
 PROVO B    2    984.70    68.03   120.17    43.79   13.77    77.62   476.56   183.29    3.26    3.55
 GOSHEN B   3   1022.36   203.04   110.65    70.64   26.70   316.50   430.08   200.17    3.03    1.50


 ***TIME PERIOD 27 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.085 FOR TIME PERIOD 27

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 27
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

   ***SUMMARY INFORMATION FOR TIME PERIOD 27     --  MONTHS

   *** PERIOD FLOWS AND INTERFLOWS

          BAY     PRECIP   EVAP   SUM THIN   VOL BEFORE   INTERFLOW          F I N A L
     NAME  NO.    AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE       AREA      VOLUME
  MAIN LK   1     3507.   28299.   -13278.     412890.     -7471.  4485.59     58082.    418362.
  PROVO B   2      270.    2151.     4726.      10875.      4660.  4485.59      3797.      6215.
  GOSHEN B  3     1643.   11503.      500.     139324.      2011.  4485.59     23200.    136513.

TOTAL SYSTEM       5420.   41952.    -8844.                 LAKE     4485.59     85079.    561089.


   *** WATER QUALITY AT THE END OF THE PERIOD

             BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
 MAIN LK      1   1297.99   179.54   111.01    63.61    24.41   273.02   426.78   249.56    4.13     1.76
 PROVO B      2    946.43    69.04   127.68    44.09    14.80    80.07   482.72   178.15    3.53     3.91
 GOSHEN B     3   1487.48   212.66   117.06    73.63    27.92   329.14   461.02   291.47    3.38     1.69




   ***TIME PERIOD 28 HAS BEGUN

   *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 28

   *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 28
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 28     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

        BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
   NAME  NO.     AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
 MAIN LK   1    13867.   12610.    26446.     446264.       3536.  4486.01    58384.   442728.
 PROVO B   2     1215.     826.     6087.      12691.       5211.  4486.01     8356.     7480.
 GOSHEN B  3     4964.    5061.     1200.     137416.      -8747.  4486.01    23680.   146163.

TOTAL SYSTEM     20046.   18497.    33733.                LAKE    4486.01    86419.   596371.


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
MAIN LK    1   1245.59   171.05   107.61   60.82   23.33   260.36   413.04   238.06    4.30     1.78
PROVO B    2    734.34    57.93    97.42   35.30   12.26    65.88   390.25   143.92    2.82     3.13
GOSHEN B   3   1442.88   205.07   114.69   70.96   26.96   318.59   451.23   281.26    3.55     1.70



 ***TIME PERIOD 29 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 29

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 29
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

***SUMMARY INFORMATION FOR TIME PERIOD 29     --  MONTHS

*** PERIOD FLOWS AND INTERFLOWS

      BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
   NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE       AREA      VOLUME
 MAIN LK   1    3696.    1410.    39121.     484134.      7821.  4486.58     58859.    476314.
 PROVO B   2     454.     105.     5619.      13447.      3001.  4486.58      4835.     10446.
 GOSHEN B  3    2249.     572.     1100.     148940.    -10822.  4486.58     24151.    159762.

TOTAL SYSTEM      6398.    2088.    45840.                   LAKE     4486.58     87845.    646522.


*** WATER QUALITY AT THE END OF THE PERIOD

           BAY    TDS        NA        CA        MG         K         CL       HCO3      SO4        NO3       PO4
MAIN LK     1    1185.98   162.04   103.25     57.67     22.88    246.97    394.94   225.43      4.43      1.77
PROVO B     2     679.07    54.69    88.16     32.15     11.10     59.41    354.37   138.82      2.41      2.68
GOSHEN B    3    1393.28   197.15   111.26     68.10     25.89    307.98    437.15   270.51      3.65      1.69



***TIME PERIOD 30 HAS BEGUN

*** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 30

*** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 30
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 30     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

        BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
    NAME  NO.    AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE     AREA     VOLUME
 MAIN LK   1     2991.    1422.    43107.     520989.        9877. 4487.17   59351.   511112.
 PROVO B   2      322.     117.     4995.      15647.        2127. 4487.17    5331.    13520.
 GOSHEN B  3     1469.     583.     1200.     161847.      -12004. 4487.17   24640.   173851.

TOTAL SYSTEM       4782.    2122.    49302.                    LAKE    4487.17    89322.   698483.


 *** WATER QUALITY AT THE END OF THE PERIOD

         BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4      NO3     PO4
MAIN LK   1   1138.15   154.07    99.68    55.12   21.07   236.45  300.12  215.21    4.54    1.77
PROVO B   2    645.63    53.51    81.49    30.27   10.24    57.77  342.13  127.93    2.37    2.64
GOSHEN B  3   1351.57   190.38   100.38    65.67   24.96   299.14  425.26  261.41    3.76    1.68




 ***TIME PERIOD 31 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.002 FOR TIME PERIOD 31

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.100 FOR TIME PERIOD 31
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 31     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

       BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
   NAME  NO,    AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
 MAIN LK   1    4647,    1434,    40406,     554732,       8916,  4487,75    59842,   545816,
 PROVO B   2     413,     129,     4554,      18358,       1773,  4487,75     5826,    16585,
 GOSHEN B  3    2258,     595,     1700,     177214,     -10689,  4487,75    25128,   187902,

TOTAL SYSTEM      7318,    2158,    46660,                    LAKE    4487,75    90795,   750303,


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS        NA        CA        MG        K        CL       HCO3      SO4        NO3       PO4
MAIN LK    1   1091.78   147,95     96,18     52.66     28,10    226,35    365,75    205.44      4,60      1,75
PROVO B    2    622,82    52,64     77.40     20.93      9.57     56,57    334,44    120,86      2,34      2,58
GOSHEN B   3   1312,13   183,88    105,08     63,27     24.00    292,25    412,45    253,16      3.83      1,67



 ***TIME PERIOD 32 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,002 FOR TIME PERIOD 32

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,100 FOR TIME PERIOD 32
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UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 32     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

       BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
   NAME  NO.    AC-FT    AC-FT INFLOW AC-FT INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
 MAIN LK   1    5683.    1446.    31960.     582013.       6670.  4488,25   60306.   575343.
 PROVO B   2     349.     141.     4443.      21237.       1717.  4488,25    6198.    19520.
 GOSHEN B  3    1109.     607.     3600.     192005.      -8387.  4488,25   25609.   200392.

TOTAL SYSTEM        7141,    2193,    40003,                  LAKE    4488,25    92112.   795254.


 *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS      NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
MAIN LK    1   1048,13  140,94    92,78    50,23    19,11  216,25  351,67  195,71     4,88     1,82
PROVO B    2    611,53   52,41    75,21    28,25     9,28   56,19  331,18  115,60     2,33     2,55
GOSHEN B   3   1300,61  100,77   102,10    61,78    23,27  296,65  403,36  251,35     3,91     1,66




 ***TIME PERIOD 33 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0,002 FOR TIME PERIOD 33

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0,100 FOR TIME PERIOD 33
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UTAH LAKE --JULY 1972-JULY 1973--MIN SPRS ADDED

 ***SUMMARY INFORMATION FOR TIME PERIOD 33     --  MONTHS

 *** PERIOD FLOWS AND INTERFLOWS

       BAY       PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
    NAME  NO.    AC-FT    AC-FT INFLOW AC-FT INTERFLOW   VOL AC-FT  STAGE       AREA      VOLUME
  MAIN LK   1    5928.    1507.    23211.    682974.       3480.  4488.64     60721.    599494.
  PROVO B   2     609.     155.     5863.     25837.       3457.  4488.64      6463.     22180.
  GOSHEN B  3    2944.     640.     1208.    203896.      -7137.  4488.64     26056.    211033.

TOTAL SYSTEM       9481.    2302.    30274.                    LAKE    4488.64    93240.   832707.


  *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG        K       CL      HCO3     SO4       NO3      PO4
MAIN LK    1   1009.11   135.09   89.86    48.19    18.28   207.71   340.22   187.55     4.83     1.79
PROVO B    2    599.99    51.35   72.85    27.67     8.97    54.82   324.55   113.86     2.26     2.46
GOSHEN B   3   1255.84   173.90   99.14    59.41    22.30   285.53   390.77   241.52     3.98     1.65



  ***TIME PERIOD 34 HAS BEGUN

  *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.095 FOR TIME PERIOD 34

  *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 34
 UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

  ***SUMMARY INFORMATION FOR TIME PERIOD 34     --  MONTHS

  *** PERIOD FLOWS AND INTERFLOWS

        BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW       F I N A L
     NAME  NO.   AC-FT   AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA     VOLUME
   MAIN LK   1    5716.   15275.    34995.     624930.       6629.  4488.95    61045.    618301.
   PROVO B   2     420.    1626.     5931.      26935.       2654.  4488.95     6670.     24251.
   GOSHMEN B 3    4558.    6555.     1000.     210036.      -9283.  4488.95    26404.    219319.

 TOTAL SYSTEM      10694.   23456.    41926.                 LAKE    4488.95     94118.   861871.


  *** WATER QUALITY AT THE END OF THE PERIOD

           BAY    TDS       NA       CA       MG       K        CL      HCO3     SO4      NO3      PO4
 MAIN LK    1    991.93   131.60    69.00    47.20    17.73   203.04   336.86   103.18    4.92     1.81
 PROVO B    2    628.32    53.62    75.77    28.99     9.34    57.29   330.05   119.64    2.34     2.52
 GOSHMEN B  3   1217.52   167.77    97.68    57.51    21.65   274.17   383.07   232.68    4.18     1.69



 ***TIME PERIOD 35 HAS BEGUN

 *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.005 FOR TIME PERIOD 35

 *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 35
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      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

       ***SUMMARY INFORMATION FOR TIME PERIOD 35      --  MONTHS

       *** PERIOD FLOWS AND INTERFLOWS

          BAY     PRECIP    EVAP   SUM TRIB   VOL BEFORE   INTERFLOW        F I N A L
     NAME  NO.    AC-FT    AC-FT INFLOW AC-FT  INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
    MAIN LK  1    4627.    30968.     98298.     690258.      29191.  4489.65    61780.    661067.
    PROVO B  2     694.     3383.      6177.      27739.      -1222.  4489.65     7139.     28961.
    GOSHEN B  3   3519.    13395.       750.     210194.     -27969.  4489.65    27196.    238162.

  TOTAL SYSTEM       8841.   47746.   105225.                   LAKE    4489.65    96116.    928191.


    *** WATER QUALITY AT THE END OF THE PERIOD

             BAY     TDS       NA       CA       MG        K        CL      HCO3     SO4       NO3      PO4
  MAIN LK     1    926.66   118.95    84.63    43.44    16.16   184.86   316.38   167.82     5.92     2.17
  PROVO B     2    691.60    60.16    82.91    32.06    10.49    67.12   363.11   132.41     2.73     2.77
  GOSHEN B    3   1185.66   161.34    97.48    55.82    20.97   261.47   378.69   223.96     4.77     1.87




    ***TIME PERIOD 36 HAS BEGUN

    *** THE INTERMIXING FRACTION FOR BAY  2 IS  0.085 FOR TIME PERIOD 36

    *** THE INTERMIXING FRACTION FOR BAY  3 IS  0.150 FOR TIME PERIOD 36
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     UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED

      ***SUMMARY INFORMATION FOR TIME PERIOD 36     --  MONTHS

      *** PERIOD FLOWS AND INTERFLOWS

         BAY      PRECIP   EVAP   SUM TRIB   VOL BEFORE   INTERFLOW      F I N A L
     NAME  NO.    AC-FT    AC-FT INFLOW AC-FT INTERFLOW   VOL AC-FT  STAGE      AREA      VOLUME
   MAIN LK   1    3139.   34634.     11589.      641161.       -689.  4489.33    61450.   641850.
   PROVO B   2     274.    4802.      5827.       31059.       4215.  4489.33     6928.    26845.
   GOSHEN B  3    2719.   15246.       535.      226169.      -3526.  4489.33    26840.   229695.

 TOTAL SYSTEM       6131.   53883.    17951.                     LAKE    4489.33    95218.   898390.


    *** WATER QUALITY AT THE END OF THE PERIOD

          BAY    TDS       NA       CA       MG       K       CL      HCO3     SO4       NO3      PO4
 MAIN LK   1    968.19   121.90    88.16    44.78    16.61   189.21   328.62   172.68    6.61     2.42
 PROVO B   2    747.00    63.12    92.15    34.99    11.81    71.82   391.26   143.48    2.99     3.87
 GOSHEN B  3   1201.92   162.37   100.22    56.43    21.19   261.66   387.19   225.23    5.38     2.84



    ***TIME PERIOD 37 HAS BEGUN
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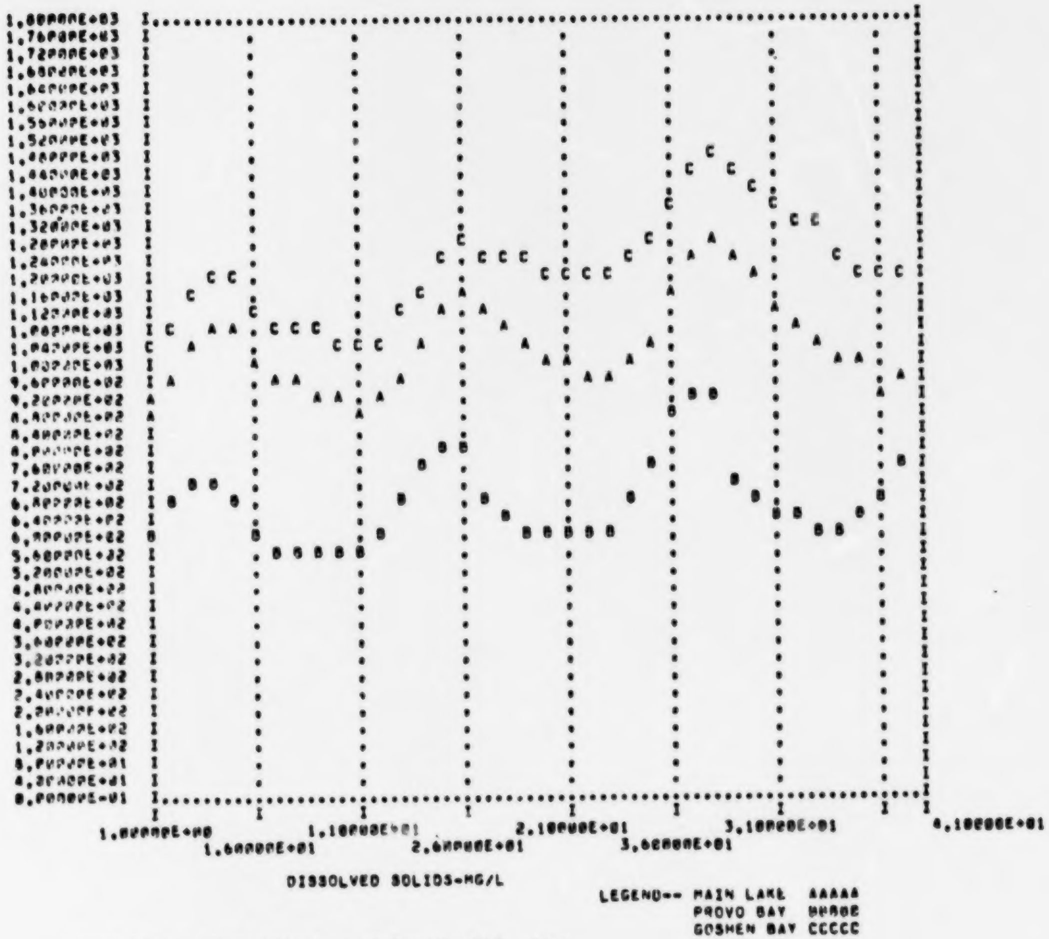
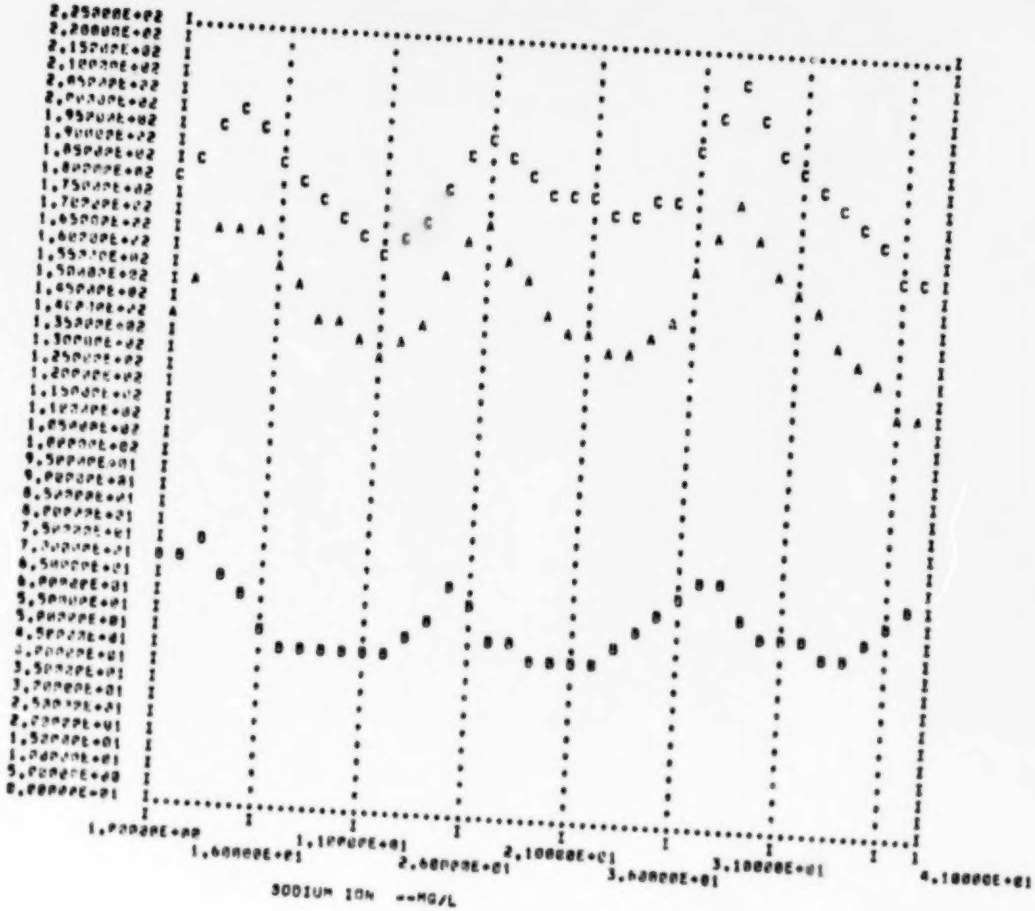


UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



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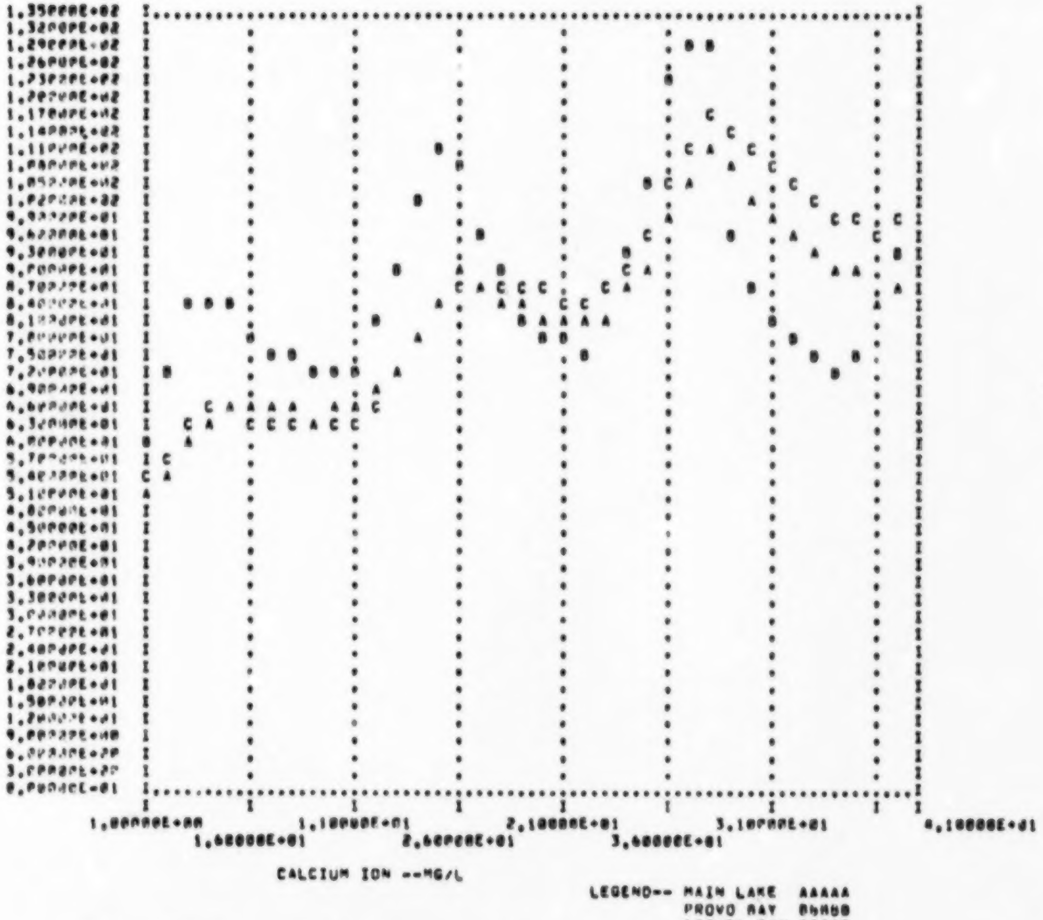
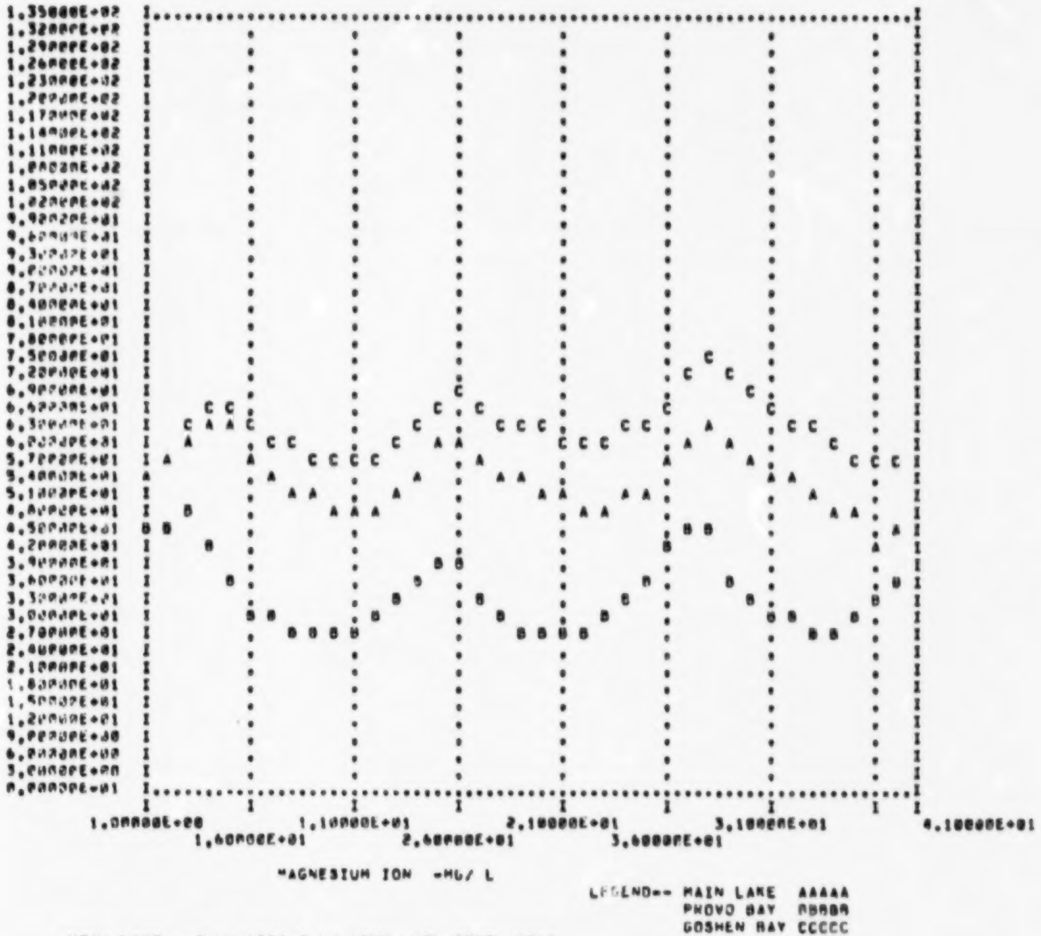
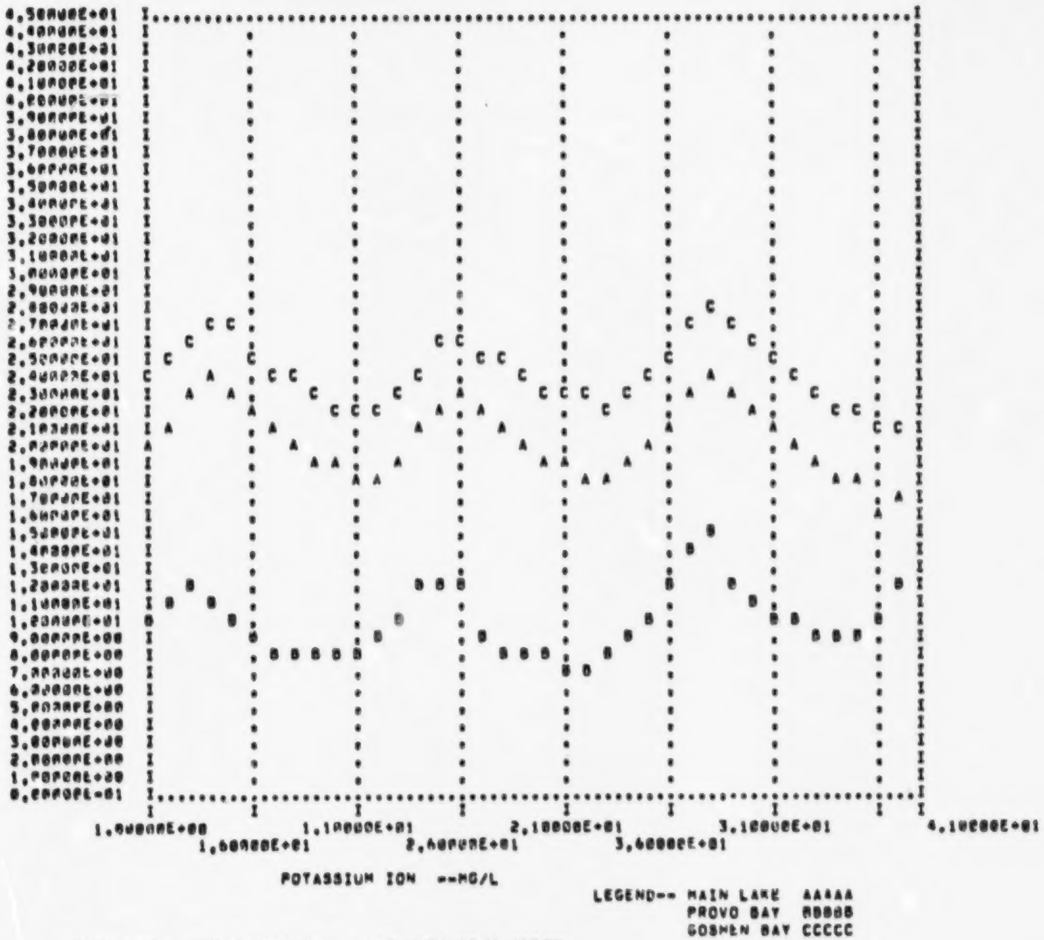


UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



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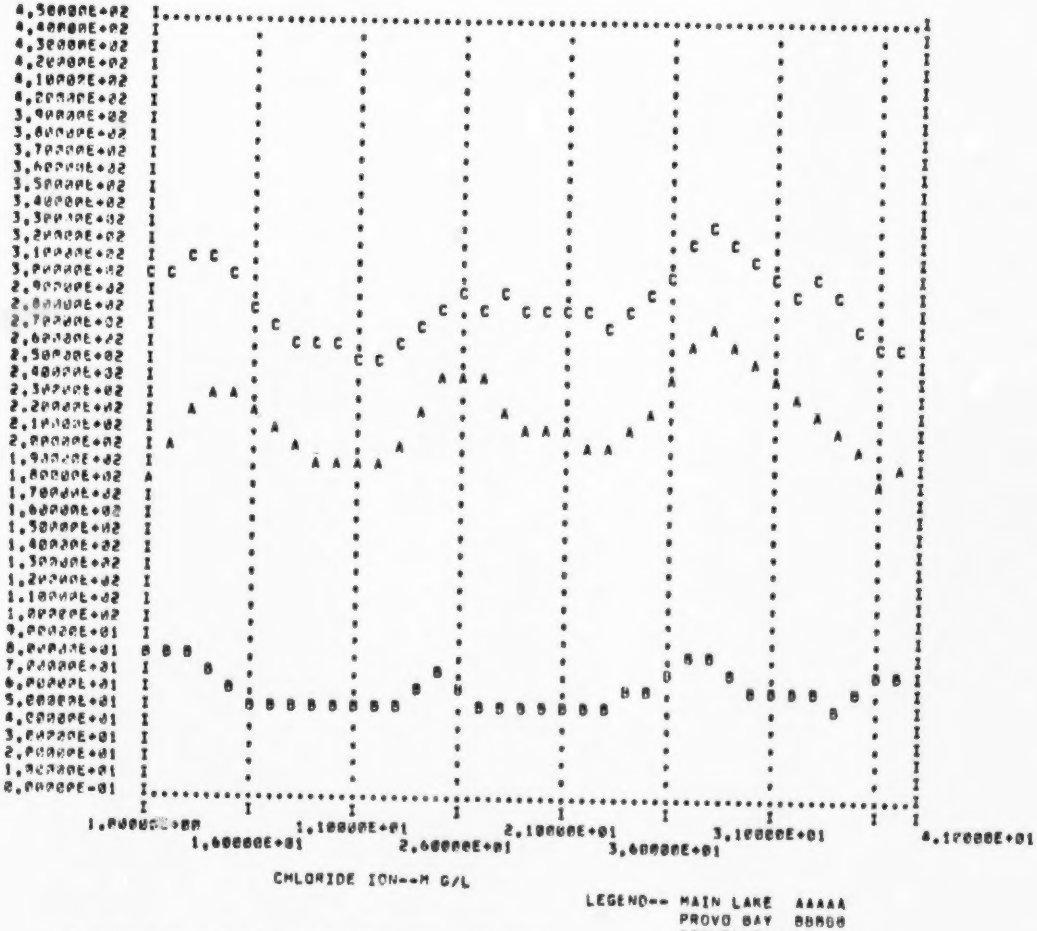
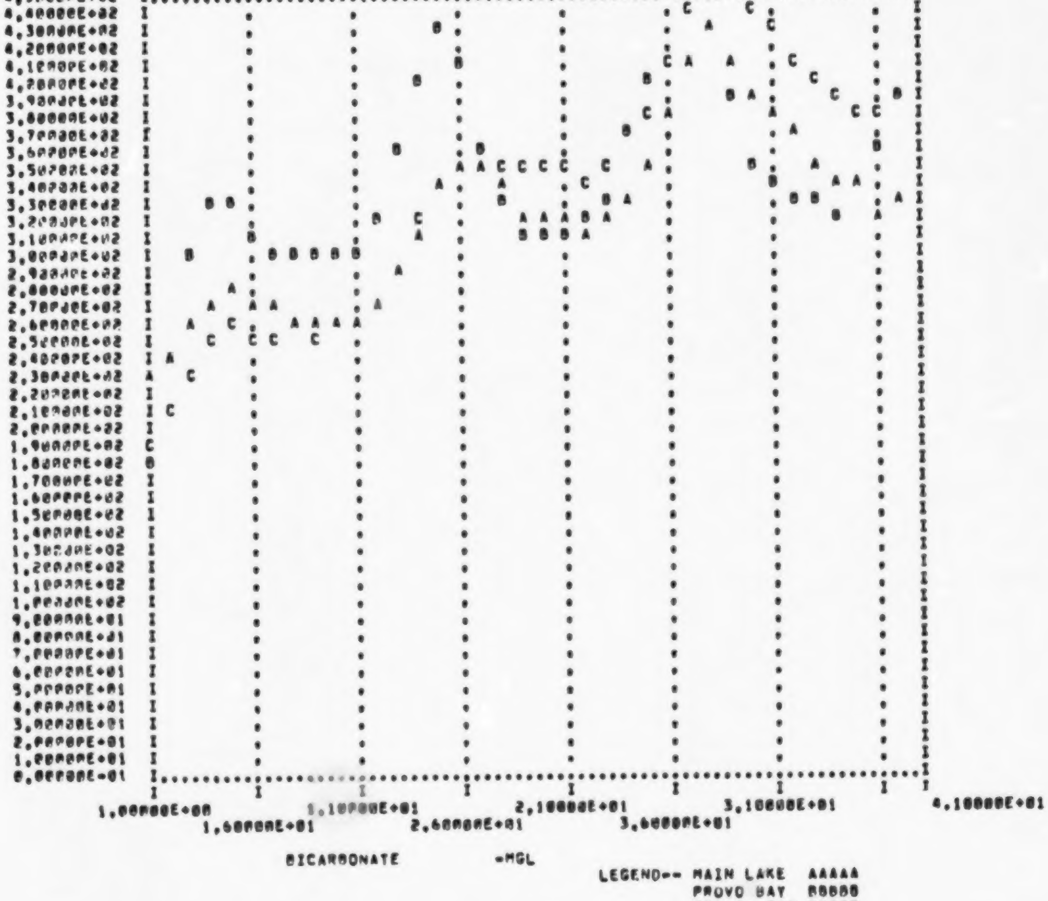


UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



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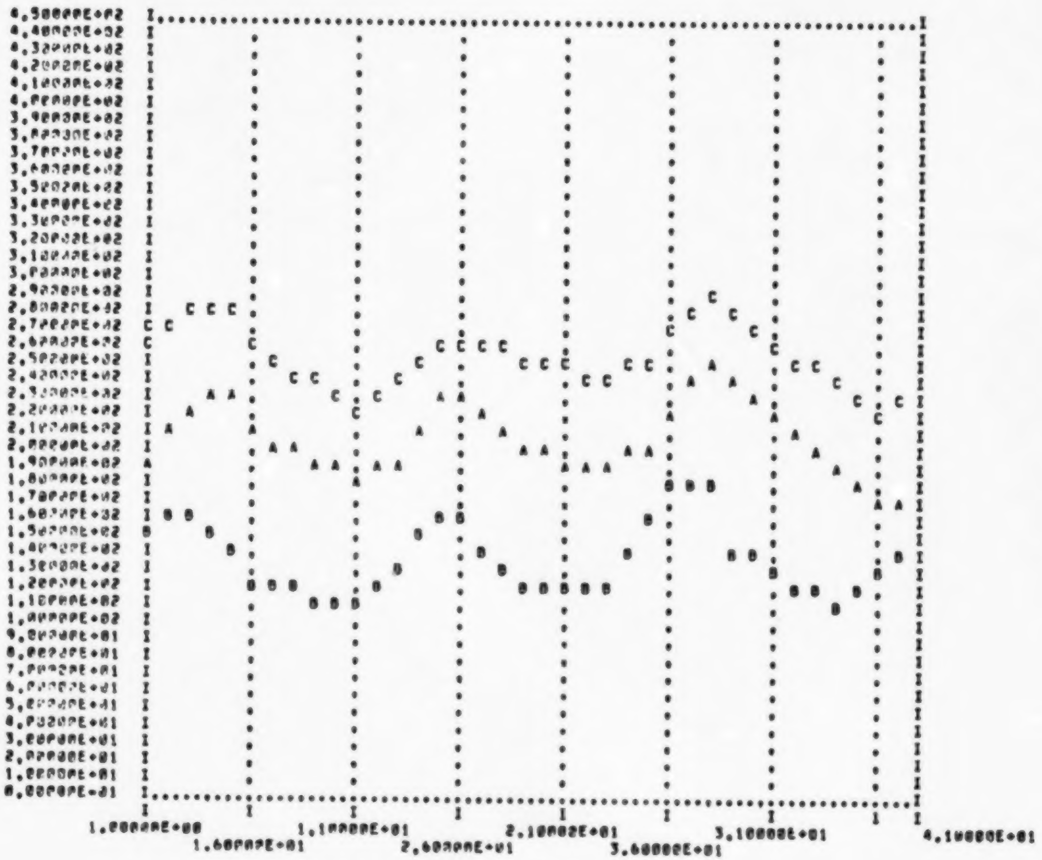
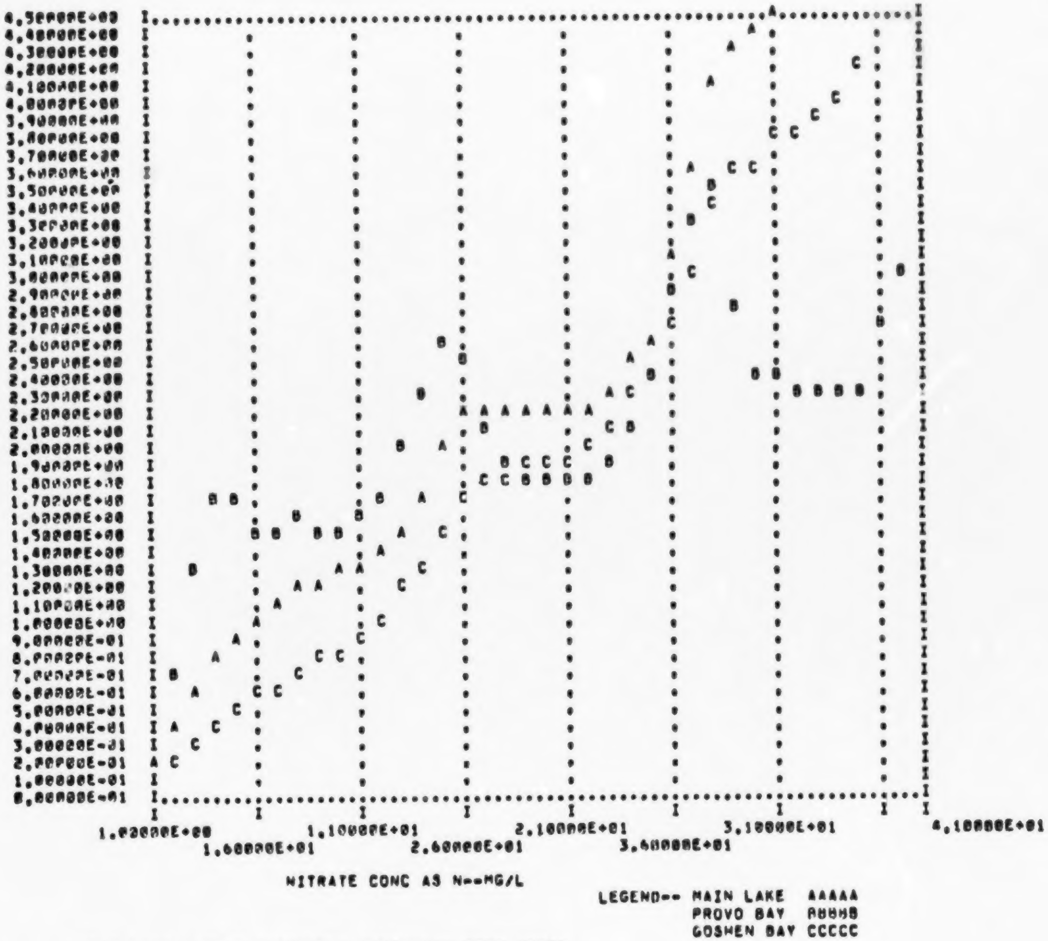
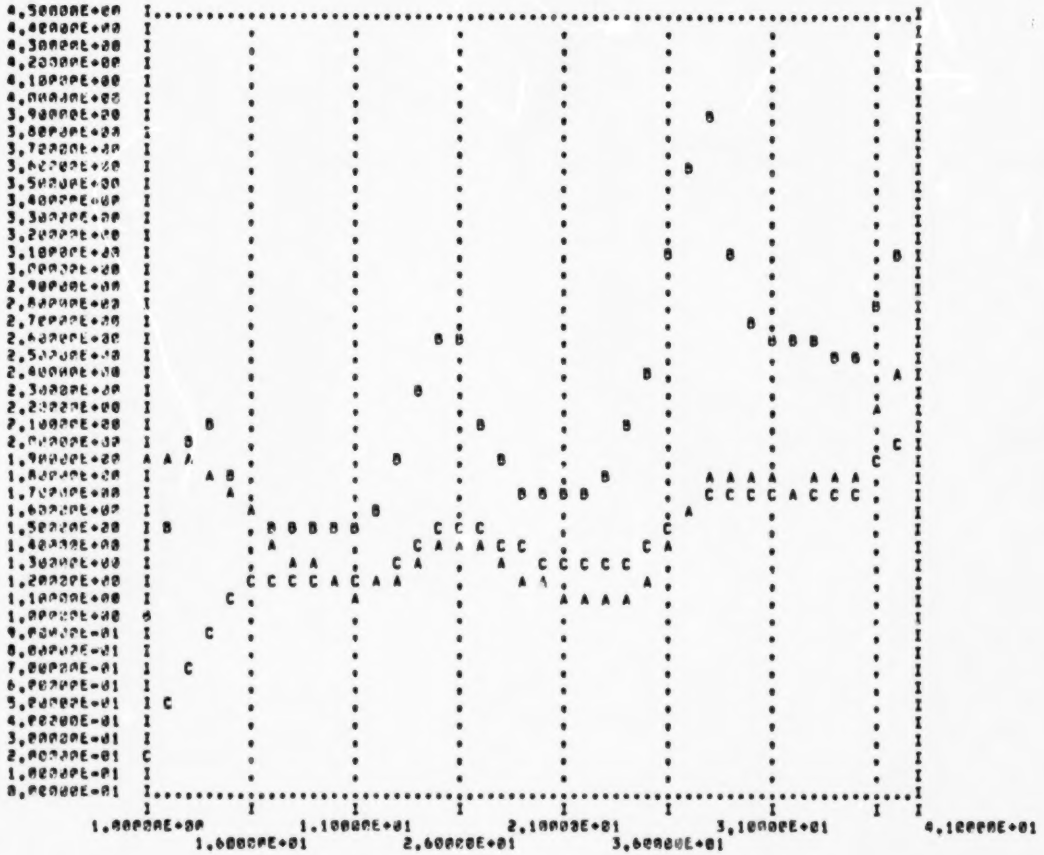


UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



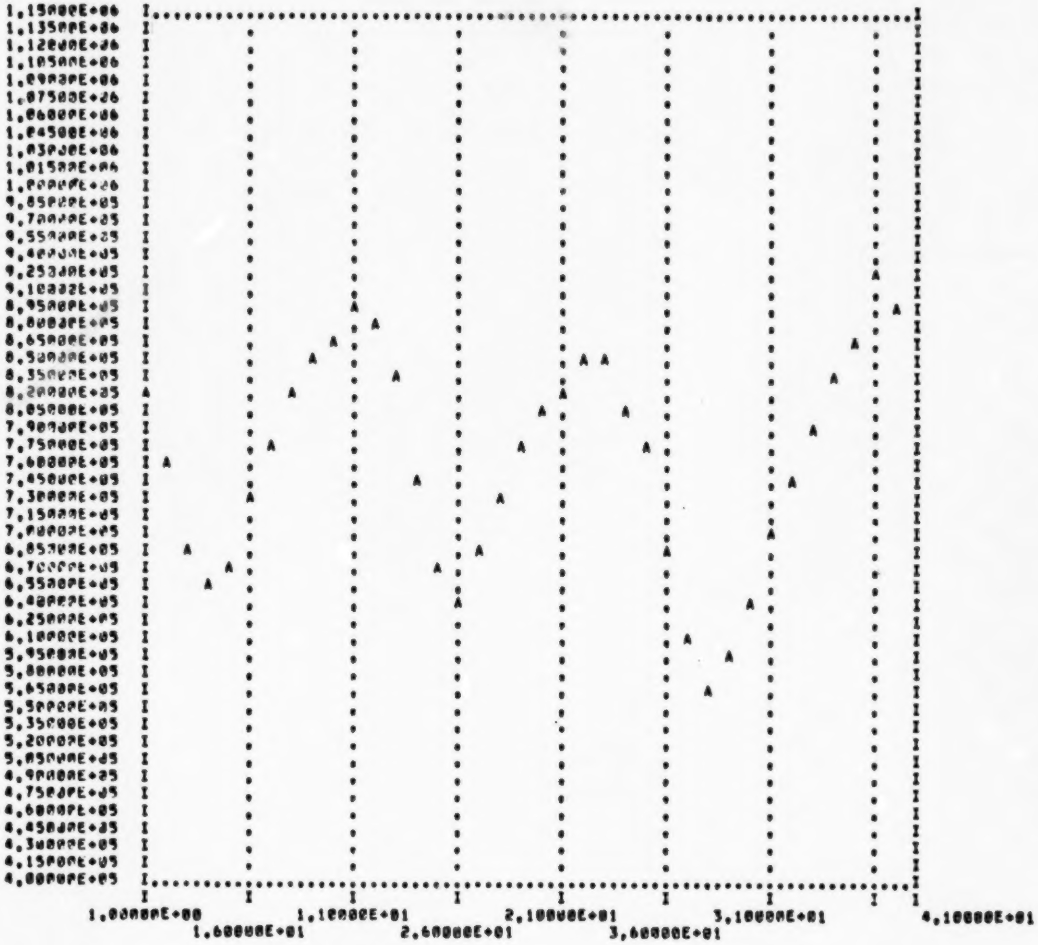
UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



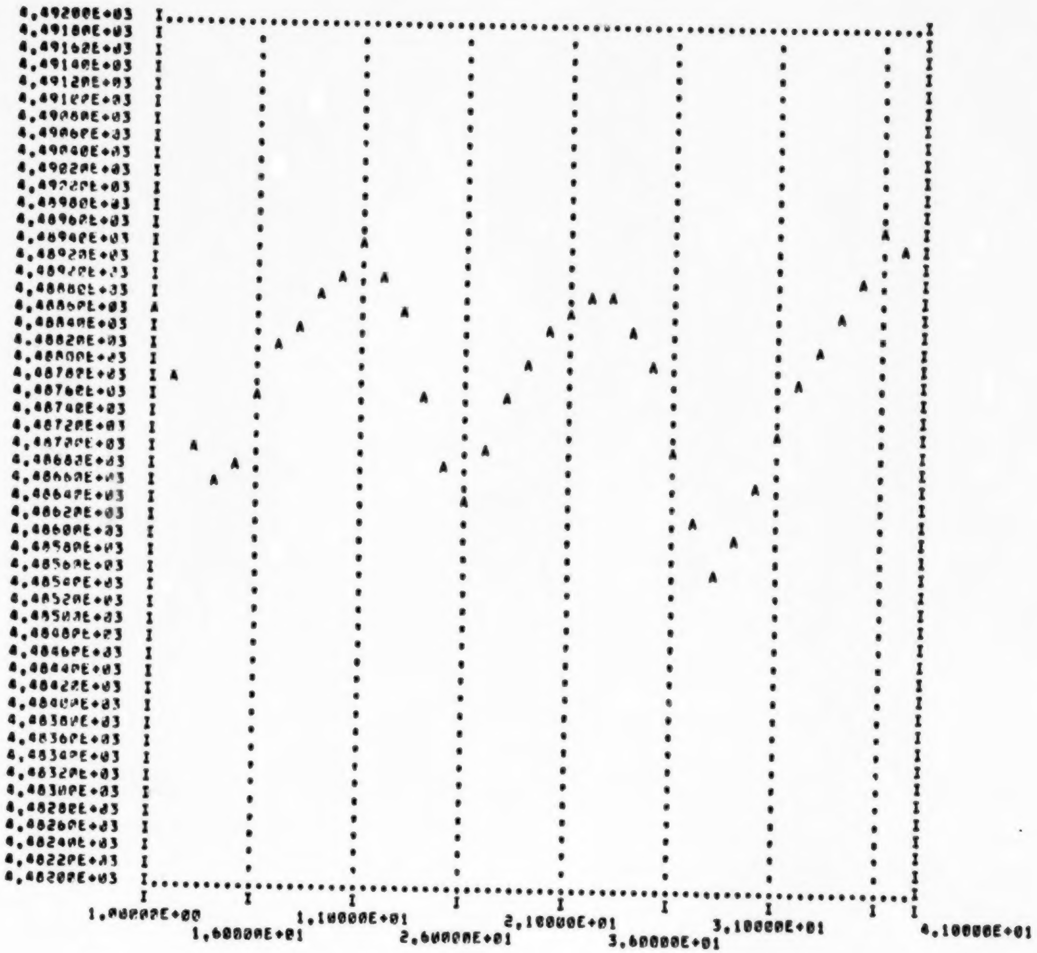
PHOSPHATE AS P --MG/L

LEGEND-- MAIN LAKE AAAAA
PROVO BAY BBBBB
GOSHEN BAY CCCCC

UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED



TOTAL LAKE VOLUME--AC-FT
UTAH LAKE --JULY 1970-JULY 1973--MIN SPHS ADDED



LAKE LEVEL IN FEET -MSL
UTAH LAKE --JULY 1970-JULY 1973--MIN SPHS ADDED

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          UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED


      ***TOTAL SALT SUMMARY FOR THE SIMULATION

                             T  O  N  S
              BAY     TDS        NA        CA        MG         K        CL      HCO3       SO4       NO3       PO4
TRIB. INFLOW  1641885.   200962.   166092.    72231.    26772.   318454.   620995.   200986.    10595.     3298.

LAKE OUTFLOW  1446854.   208297.   112452.    75863.    28555.   302594.   444826.   208510.     3313.     2074.
LAKE . .
  BEGINNING   1045026.   166658.    57914.    61519.    23320.   233494.   245634.   233702.      248.     1634.
  ENDING      1240057.   159324.   111554.    57887.    21537.   249354.   421803.   226178.     7530.     2857.
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      UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED


   ***TRIBUTARY FLOWS AND SALT QUANTITIES
                          SALTS-- TONS TOTAL FOR THE SIMULATION

BAY  1                                                                                   
       BAY      TDS       NA        CA        MG        K         CL       HCO3      SO4       NO3       PO4
TRIB.  FLOW
      AC-FT
 1     259.     126.     17.53     19.64     5.26      3.16      4.21     78.69     25.25     0.379     0.154
   PCT 0.014    0.008     0.009     0.012     0.007     0.012     0.001     0.013     0.009     0.004     0.005

 2     258.     110.     4.91      19.64     4.56      2.10      2.10     78.69     25.25     0.140     0.028
   PCT 0.014    0.007     0.002     0.012     0.006     0.008     0.001     0.013     0.009     0.001     0.001

 3     212.     121.     14.90     20.74     13.25     0.52      14.69    121.01     28.52     0.300     0.127
   PCT 0.012    0.007     0.007     0.012     0.018     0.002     0.005     0.019     0.010     0.003     0.004

 4     746.     669.     44.61     101.39    28.39     9.30      30.42    304.16     98.85     1.784     0.041
   PCT 0.041    0.041     0.022     0.061     0.039     0.035     0.010     0.049     0.035     0.017     0.001

 5     515.     315.     14.00     42.00     25.38     1.26      12.60    199.40     29.40     0.504     0.056
   PCT 0.028    0.019     0.007     0.025     0.035     0.005     0.004     0.032     0.010     0.005     0.002

 6     2411.    2163.    104.86    283.05    95.51     25.56     98.30    1327.07    235.92    0.578     0.393
   PCT 0.132    0.132     0.052     0.170     0.132     0.095     0.031     0.214     0.084     0.001     0.012

 7     1909.    1427.    103.78    166.05    108.97    20.24     44.11    934.01     212.75    2.698     0.208
   PCT 0.104    0.087     0.052     0.100     0.151     0.076     0.014     0.150     0.076     0.025     0.006

 8     7399.    6637.    442.45    724.02    402.23    103.70    331.04   3770.91    724.02    31.676    10.056
   PCT 0.405    0.404     0.220     0.436     0.557     0.387     0.104     0.607     0.258     0.299     0.305

 9     48086.   27402.   1565.85   6263.38   2479.26   274.02    1304.07  20551.73   5871.92   150.151   13.049
   PCT 2.627    1.669     0.779     3.771     3.032     1.024     0.410     3.309     2.090     1.417     0.396

10     5101.    3744.    117.85    623.94    194.11    29.12     103.99   2391.75    623.94    14.974    0.277
   PCT 0.279    0.228     0.059     0.376     0.269     0.109     0.033     0.385     0.222     0.141     0.008

11     4202.    3541.    542.53    394.05    137.06    45.69     890.89   1810.33    428.31    22.272    98.797
   PCT 0.230    0.216     0.270     0.237     0.190     0.171     0.280     0.292     0.152     0.210     2.996
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        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED
---CONTINUED

BAY  1
          BAY      TDS       NA        CA        MG         K         CL       HCO3      SO4       NO3       PO4
TRIB.   FLOW
        AC-FT
12      2058.     1594.     44.75    246.13     72.72     11.75     39.16    839.09    251.73     4.475     0.112
     PCT 0.113     0.097     0.022     0.148     0.101     0.044     0.012     0.135     0.090     0.042     0.003

13      1830.     1136.     67.34    179.85    104.91     11.24     29.98    674.45    169.64     2.598     0.100
     PCT 0.101     0.069     0.034     0.108     0.145     0.042     0.009     0.109     0.060     0.025     0.003

14      3344.     2045.     63.63    405.64    118.16     13.63     54.54   1431.59    409.03     7.272     0.182
     PCT 0.183     0.125     0.032     0.244     0.164     0.051     0.017     0.231     0.146     0.069     0.006

15      3689.     2106.     60.16    421.14    110.30     15.04     60.16   1420.88    330.90    13.236     0.301
     PCT 0.202     0.128     0.030     0.254     0.153     0.056     0.019     0.230     0.118     0.125     0.009

16      2577.     2101.     84.06    392.26    133.09     10.51     84.06   1050.70    231.15     7.285     0.140
     PCT 0.141     0.128     0.042     0.236     0.184     0.039     0.026     0.169     0.082     0.069     0.004

17      6624.     5672.    148.62    828.23    306.00     43.21    162.04   3240.90   1260.35    25.207     0.720
     PCT 0.362     0.345     0.074     0.499     0.424     0.161     0.051     0.522     0.449     0.238     0.022

18     66795.    57191.   3260.05   8714.60   3812.73    490.21   2904.93  33500.29  10076.49   204.253    59.914
     PCT 3.655     3.483     1.626     5.247     5.279     1.831     0.912     5.409     3.586     1.928     1.817

19        14.       11.      0.57      1.33      0.88      0.51      0.40      6.75      1.40     0.014     0.003
     PCT 0.001     0.001     0.000     0.001     0.001     0.002     0.000     0.001     0.001     0.000     0.000

20     80120.    67511.   5224.66   9255.55   3375.55   1960.00   6960.00  29944.42  20797.76  4020.005    76.222
     PCT 4.384     4.112     2.601     5.573     4.673     7.321     2.188     4.822     7.402    38.027     2.311

21         0.        0.      0.00      0.00      0.00      0.00      0.00      0.00      0.00     0.000     0.000
     PCT 0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

22       106.       86.      4.32     10.08      6.63      3.89      3.03     51.14     11.24     0.108     0.024
     PCT 0.006     0.005     0.002     0.006     0.009     0.015     0.001     0.008     0.004     0.001     0.001

23        86.       70.      3.51      8.18      5.30      3.16      2.45     41.49      9.12     0.008     0.020
     PCT 0.005     0.004     0.002     0.005     0.007     0.012     0.001     0.007     0.003     0.001     0.001
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        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED
*--CONTINUED

BAY  1
          BAY      TDS        NA        CA        MG        K         CL       HCO3      SO4       NO3       PO4
TRIB,   FLOW
        AC-FT
24        362.      251.     11.81     44.28     20.66     20.66      7.38   162.35     19.68     0.354     0.030
     PCT 0.020     0.015     0.006     0.027     0.029     0.077     0.002    0.026     0.007     0.003     0.021

25       1805.     1760.     92.23    174.21     92.23     41.50     69.17  1114.40    199.02     2.049     0.410
     PCT 0.103     0.108     0.046     0.105     0.128     0.155     0.022    0.179     0.071     0.019     0.012

26       9918.     6457.   1078.34    727.88    283.26    134.79   1590.55  4394.24    660.48    57.961   296.544
     PCT 0.543     0.393     0.537     0.438     0.392     0.503     0.499    0.708     0.235     0.547     8.993

27      50340.    41049.   9509.77   3352.37   3557.61   1299.90  12725.31 15461.94  14435.70    68.416    27.366
     PCT 2.754     2.500     4.732     2.018     4.925     4.855     3.996    2.490     5.138     0.646     0.030

28       1532.     1187.     54.13    212.37     47.89      9.37     37.48   812.02    237.36     2.124     0.083
     PCT 0.084     0.072     0.027     0.128     0.066     0.035     0.212    0.131     0.084     0.020     0.003

29     507267.   227586.   8272.94  41364.72  11030.59   2068.24  12409.42124094.16  35160.01   220.612    82.729
     PCT 27.754   13.856     4.117    24.905    15.271     7.725     3.097   19.903    12.513     2.082     2.509

48     223112.   136762.  12432.92  17486.09   7459.75   1243.29  17406.09 74597.52  22379.26   124.329    49.732
     PCT 12.207    8.330     6.187    10.480    10.328     4.644     5.466   12.013     7.965     1.173     1.508

49       1120.     2101.    502.31     97.42    148.41     19.10    429.25   898.07    593.64     1.461     0.913
     PCT 0.061     0.128     0.250     0.059     0.205     0.072     0.135    0.145     0.211  [illegible]   0.228

50       6277.    25934.   5630.39   1160.20   1322.29     87.02   5118.53  6142.24   6654.09     4.095     1.024
     PCT 0.343     1.580     2.802     0.690     1.831     0.325     1.607    0.909     2.360     0.039     0.031

51      99498.   124702.  22177.59  11358.69   9063.80   2271.78  17150.14 63508.41  24566.97   129.816    70.993
     PCT 5.444     7.595    11.036     6.839    12.548     8.486     5.308   10.238     8.743     1.225     2.153

53 -1052366. 1444854.208296.58112451.82  75062.87  28555.34302594.84444826.30280509.63  3312.504  2073.942
     PCT100.000  100.000   100.000   100.000   100.000   100.000   100.002  100.000   100.000   100.000   100.000

54      17424.    33153.   5209.70   2202.28    236.80    734.09   7814.55  5470.19   9708.99     0.000     0.002
     PCT 0.953     2.019     2.592     1.326     0.328     2.742     2.054    0.881     3.455     0.000     0.000
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        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED
---CONTINUED

BAY  1
          BAY     TDS        NA         CA         MG         K          CL       HCO3      SO4        NO3        PO4
TRIB,   FLOW
        AC-FT
55    24120.  157340. 23110.46  8096.86  5146.59  4523.75 59661.05  4818.78 21635.33    0.000      0.000
    PCT  1.320    9.583   11.500     4.875      7.125     16.898     18.735      0.776      7.700      0.000      0.000

56    24120.  229466. 60316.67  4589.31  3737.81  5244.93 96703.36 24388.92 23602.18    0.000      0.000
    PCT  1.320   13.976   30.014     2.763      5.174     19.591     30.366      3.927      8.400      0.000      0.000

59   109557.   84871.  1786.75  8933.75  2382.33   446.69  2680.12 26801.24  7593.68 4764.665 1786.749
    PCT  5.996    5.169    0.889     5.379      3.298      1.669      0.842      4.316      2.703     44.972     54.184

60   207000.   44702.  2416.32  7248.96  2416.32  1208.16  1812.24 32620.32  6040.00    1.208      6.041
    PCT 11.326    2.723    1.202     4.364      3.345      4.513      0.569      5.253      2.150      0.011      0.183
                     SALTS-- TONS TOTAL FOR THE SIMULATION

BAY  2
          BAY     TDS        NA         CA         MG         K          CL       HCO3      SO4        NO3        PO4
TRIB,   FLOW
        AC-FT
31     2744.    1902.    67.13   328.18    78.32    13.43    67.13  1230.67   212.57    0.746      0.298
    PCT  0.150    0.116    0.033     0.198      0.108      0.050      0.021      0.198      0.076      0.007      0.009

32     1169.     906.    41.31   162.05    36.54     7.15    28.68   619.61   181.12    1.621      0.064
    PCT  0.064    0.055    0.021     0.098      0.051      0.027      0.009      0.100      0.064      0.015      0.002

33      154.      80.     6.28    12.14     4.48     0.88     5.02    54.94     3.77    0.025      0.025
    PCT  0.008    0.005    0.003     0.007      0.006      0.003      0.002      0.009      0.001      0.000      0.001

34    16148.    9213.   394.84  1886.45   460.64   120.18   526.45  6221.55  1184.51   28.077      3.598
    PCT  0.883    0.561    0.196     1.136      0.638      0.449      0.165      1.002      0.422      0.265      0.109

35     2666.    1196.    50.73   210.15    59.78    10.87    43.48  1032.64   173.92    2.609      0.298
    PCT  0.146    0.073    0.025     0.127      0.083      0.041      0.014      0.166      0.062      0.025      0.009

36     1142.     559.    31.04    62.08    41.91     5.59    18.62   349.21    46.56    0.497      0.124
    PCT  0.062    0.034    0.015     0.037      0.058      0.021      0.006      0.056      0.017      0.005      0.004

37     1681.    1371.    45.69   228.46    59.48    11.88    41.12   913.84   130.22    3.107      0.183
    PCT  0.092    0.083    0.023     0.138      0.082      0.044      0.013      0.147      0.046      0.029      0.006

38    33147.   17569.   720.79  3063.34   765.84   135.15   720.79 11487.53  1892.06   36.039      4.505
    PCT  1.814    1.070    0.359     1.844      1.060      0.505      0.226      1.850      0.673      0.340      0.137
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        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED
---CONTINUED

BAY  2
          BAY     TDS       NA        CA        MG        K          CL        HCO3     SO4        NO3       PO4
TRIB.   FLOW
        AC-FT
39     42770.    25402.  2673.86   4010.00   1162.55    406.89   4533.94  17147.61  2200.84   360.390   482.450
    PCT  2.340    1.547    1.331     2.415     1.609     1.520     1.424     2.761    0.786     3.402    14.631

40      4043.     2473.   153.85    373.64    164.84    200.00     98.91   1403.50   230.70     4.396     0.330
    PCT  0.221    0.151    0.077     0.225     0.228     0.780     0.031     0.239    0.082     0.041     0.010

41     12093.     7396.   460.19   1117.60    493.06    624.54    295.83   4437.52   690.20    13.140     0.986
    PCT  0.662    0.450    0.229     0.673     0.683     2.333     0.093     0.715    0.246     0.124     0.030

42     51680.    54785.  3371.37   7280.70   2649.39    421.42   2520.52  21071.04 18191.33    39.333    53.731
    PCT  2.828    3.337    1.678     4.388     3.668     1.574     0.794     3.393    6.474     0.371     1.629

43     19427.    15842.   844.89   2772.28    844.89    409.54   1504.16   7120.72  3326.74    36.964    56.766
    PCT  1.063    0.965    0.420     1.669     1.170     1.530     0.497     1.140    1.184     0.349     1.721

44     31790.    13396.   432.16   2765.81    691.45     77.79    777.80   9075.31  2060.10    31.115     4.322
    PCT  1.740    0.816    0.215     1.665     0.957     0.291     0.244     1.461    0.733     0.294     0.131

45      6617.     7326.   884.78    755.41    433.03     82.44    699.28   4130.50  1491.35    13.669     2.878
    PCT  0.362    0.446    0.440     0.455     0.600     0.308     0.220     0.665    0.531     0.129     0.087

46      6567.     6426.   499.80    535.50    374.85     32.13    285.60   3614.63  1071.00    12.852     0.714
    PCT  0.359    0.391    0.249     0.322     0.519     0.120     0.090     0.582    0.381     0.121     0.022

47     33047.    41769.  5254.85   2335.49   1616.00    458.11   4581.15  22232.05  8084.38   104.199   101.055
    PCT  1.808    2.544    2.615     1.406     2.238     1.711     1.439     3.580    2.877     0.983     3.065


                    SALTS-- TONS TOTAL FOR THE SIMULATION

BAY  3
          BAY     TDS       NA        CA        MG        K          CL        HCO3     SO4        NO3       PO4
TRIB.   FLOW
        AC-FT
52     21025.    96867. 11429.79   1285.85   3000.32    714.36  40004.26  13572.80 22288.89     2.000     1.714
    PCT  1.150    5.900    5.680     0.774     4.154     2.668    12.562     2.186    7.932     0.019     0.052

57      9020.    17614.  4403.39    452.57    452.57    293.56   6605.09   2984.52  1100.85     0.000     0.002
    PCT  0.492    1.073    2.191     0.272     0.627     1.097     2.074     0.481    0.392     0.000     0.000
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58     9000,   16757,  4640,02   354,72   354,72   385,79  6230,14  2984,52  1076,38    0,000    0,000
   PCT  0,492    1,021    2,313    0,214    0,491    1,142    1,959    0,481    0,383    0,000    0,000




        UTAH LAKE --JULY 1970-JULY 1973--MIN SPRS ADDED


     ***WATER BALANCE FOR THE SIMULATION

          BAY  PRECIP    EVAP  TRIB INFLOW      BEGINNING       ENDING
                AC-FT   AC-FT     AC-FT      STAGE   VOLUME   STAGE   VOLUME
MAIN LK    1  161951,  633978, 1521799,     4488,58 595789,8 4489,33 641850,1
PROVO B    2   19050,   63356,  266885,     4488,58  21771,5 4489,33  26844,5
GOLDEN B   3   81293,  268882,   39025,     4488,58 209400.7 4489,33 229695,1

          ***TOTAL LAKE  --  AC-FT   (EXCLUDING DIKED BAYS, IF ANY)
     TOTAL PRECIPITATION=   262293,6
     TOTAL EVAPORATION  =   966207,6
     TOTAL TRIB. INFLOW =  1827709,1
     TOTAL TRIB, OUTFLOW= -1052366,4
     OTHER OVERFLOW     =        0,0 (ENDING VOLUME HAS BEEN ADJUSTED FOR OVERFLOW)
     BEGINNING  VOLUME  =   826961,1     STAGE= 4488,58
     ENDING  VOLUME     =   898389,8     STAGE= 4489,33


     CHECK=       -0,0  (IF NOT ZERO--PROG ERROR)
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